

ESSENTIALS  
OF  
PRESCRIPTION WRITING  
—  
EGGLESTON

Fourth Edition  
Revised

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# ESSENTIALS OF PRESCRIPTION WRITING

BY

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## PREFACE TO FOURTH EDITION

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THE preparation of this fourth edition has given opportunity for the incorporation of two changes for which the time did not appear earlier to have been ripe. The first of these new features comprises the emphasis which is now properly laid upon the use of the metric system in the writing of prescriptions. It is to be hoped that the medical students of today, who are to be the physicians of tomorrow, will adopt this modern system to the exclusion of the more cumbersome and less easily used Apothecaries' system.

The second change lies in the encouragement of the modern American physician to employ the English language in his writing of prescriptions thereby increasing their grammatical accuracy and diminishing materially his own labors. It must be recognized, however, that the educated physician is required to be familiar both with the Apothecaries' system of weights and measures and with prescription Latin that he may be at home in his study of the less recent medical literature. To this end the chapters on these subjects have been retained with but minor alterations.

The entire text of the book has been revised completely in the endeavor to make certain

portions clearer and more direct, although no radical changes have been introduced. The nomenclature has been made to conform to the alterations that have been introduced into the New Pharmacopœia and National Formulary so as to bring the material up to date. There have been no significant additions or deletions throughout the text so that the scope and character of the work has not been altered to any material extent.

CARY EGGLESTON.

NEW YORK CITY,  
*April*, 1928.

## PREFACE

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THIS small volume is intended to provide the student of medicine with a succinct, yet sufficient, treatment of the subject of prescription writing. It is designed to carry him through the subject in a sequential manner, and to prepare him to construct a grammatic and proper prescription to fill any need. The work is a crystallization of the author's experience in teaching the subject, and has been prepared with a view of reducing the burden of the already overworked student. The author's greatest gratification will come from the realization that he has accomplished his purpose, even in small measure.

Second only to the pleasure of having his desire fulfilled is the pleasure that the author derives from expressing his gratitude to Dr. Robert A. Hatcher, who has given him inspiration and encouragement during the preparation of these pages, and who has kindly and critically read them and made many valuable suggestions which have done much to enhance the worth of the volume.

CARY EGGLESTON.

NEW YORK CITY,



# CONTENTS

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## CHAPTER I

	PAGES
INTRODUCTION. . . . .	17-22
Scope, 17—Pharmacopœia, 18—National Formulary, 19—The prescription defined, 20—Parts of the prescription, 20, 21.	

## CHAPTER II

LATIN GRAMMAR. . . . .	23-44
Reasons for use of Latin, 23— <b>Nouns</b> , 24—First declension, 25—Second declension, 26—Third declension, 26, 27—Fourth declension, 28—Fifth declension, 28—Rules for forming genitive, 29—Rules for forming accusative, 30—Indeclinable nouns, 31—Names of preparations in first and second declensions, 31— <b>Adjectives</b> , 32— <b>Verbs</b> , principal parts, 33, 34—Forms in use, 34, 35—Subjunctive endings, 35, 36—Table of principal parts, 37—Verbs useful in prescriptions, 38— <b>Prepositions</b> , 38— <b>Conjunctions</b> , 39— <b>Adverbs</b> , 39—Words and phrases, 40—Abbreviations, 40—Table of common abbreviations, 41—Table of common words and phrases, 42-44.	

## CHAPTER III

GRAMMATIC CONSTRUCTION OF PRESCRIPTIONS	45-55
Official Latin titles, 45—Capitalization of words in official titles, 46—Order of words	

in official titles, 46—Rules, 47—Super-  
scription, 47—Inscription, 48, 49—Sub-  
scription, 50—Subscription types, 50-55.

## CHAPTER IV

### WEIGHTS AND MEASURES . . . . . 56-68

Advantages of metric system, 56-68—  
**Metric System**, 58-65—Units, 59—Pre-  
fixes for multiplication and division of  
units, 59—Table of metric weights, 60—  
Table of metric fluid measures, 60—  
Relation of weight to measure, 61—  
Relation of metric to apothecaries' system,  
62, 64—Table of equivalents, 63, 64—  
Rules for conversion from apothecaries' to  
metric, 64—**Apothecaries' System**, 65-68—  
Table of apothecaries' weights, 65—Table  
of apothecaries' fluid measures, 66—House-  
hold measures, 68—Table of equivalents  
of household measures, 68.

## CHAPTER V

### PRACTICAL WRITING OF PRESCRIPTIONS. . . . . 69-88

Typical prescription, 69, 70—Construction  
of prescription, 71-73—Size of dose, total  
volume of prescription, 71, 72—Calculation  
of amount of ingredient, 73, 74—The  
"Standard" prescription, 74—Methods  
of calculation for use when writing in the  
apothecaries' system, 77—Formula for  
calculation, 78—The use of Q. S. to express  
indefinite quantities, 80—Percentage in  
prescriptions, 81—Uses of ana or āā, 84—  
Classification of prescriptions, 86-88.

## CHAPTER VI

### DOSES OF DRUGS. . . . . 89-96

Average dose, discussion, 89—Factors

modifying dose, 90—Age, weight, 90—Sex, idiosyncrasy, 91—Disease, 92—Doses for children, 95—Clark's rule, 95—Young's rule, 95—Cowling's rule, 95—Dilling's formula, 96—Gabius' fractions, 96.

## CHAPTER VII

## VEHICLES . . . . . 97-109

Flavoring, 97, 98—Aqueous vehicles, 98, 99—Hydro-alcoholic vehicles, 100—Alcoholic vehicles, 100—Coloring, 101—Coloring agents, 102—Tinctura cardamomi composita, 102—Liquor carmini, 103—Liquor cocci, Tinctura persionis, Tinctura persionis composita, 103—Tinctura caramellis, 104—Tinctura lavandulæ composita, Tinctura croci, Tinctura hydrastis, 104—Notes, 105—Directions to patient, 105—"Shake well," 105—"Poison" labels, 106—"External use only," 106—"Ne repetatur," 107—Prescriptions for Narcotics, 107—Prescriptions for alcoholic preparations, 108—"Pp.," 109.

## CHAPTER VIII

## INCOMPATIBILITY. . . . . 110-117

Definition, classes, 110—Acids, 111—Alcohol, Alkalis, Alkaloids, 112—Carbonates, 113—Chloral Hydrate, Chlorates, Oxidizing substances, Epinephrin, Glucosids, Iron, 113—Mercury, 114—Oils, 115—Resins, Salts of metals, Spirits, Water, 115—Waters, 116—General suggestions, 116, 117.

## CHAPTER IX

## MODES OF ADMINISTRATION OF MEDICAL AGENTS. . . . . 118-123

By mouth, 118, 120—By rectum, 120—



Hypodermic injection, 121—Intravenous injections, 122—Inhalation, fumigation, baths, inunction, cataphoresis, 122, 123.

## CHAPTER X

### SUGGESTIONS FOR PRESCRIBING OFFICIAL PREP-

ARATIONS . . . . . 124-135

Acids, Decoctions, 125—Elixirs, Emulsions, 126—Extracts, Fluidextracts, Fluidglycerates, 127—Infusions, Mixtures, 128—Mucilages, Oils, Oleoresins, Pills, 129—Powders, 130—Resins, Solutions, Spirits, Syrup, Tinctures, 131—Triturates, Vinegars, Waters, Wines, 132—Preparations for external use—Cerates, Oleates, Ointments, Cataplasms, Glycerites, 133—Liniments, Lotions, Medicated papers, Plasters, Pastes, Powders, Suppositories, 134—Troches, 135.

## CHAPTER XI

### PRACTICE PRESCRIPTIONS . . . . . 136-145

For local external application, 136, 137—  
Preparations for internal administration,  
138-145.

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INDEX. . . . . 147

# ESSENTIALS OF PRESCRIPTION WRITING

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## CHAPTER I

### INTRODUCTION

THE material offered in the following pages is intended to supply to the student and the practitioner a concise presentation of the fundamental principles which underlie the art of prescription writing, stripped of all that is not essential to their clear comprehension. The desirability of such a presentation is evident to many who teach this subject, for, despite the fact that there are many text-books which treat the subject with greater or less comprehensiveness, the existing works are, in general, either too brief to be of much use, or they are too extensive to be readily helpful to the one seeking information.

It has been my endeavor to carry the student, in a more or less sequential manner, through the several fundamental steps, including the Latin grammar, up to the construction of a proper prescription, and to offer some suggestions as to flavoring, coloring, modes of prescribing the official preparations, and points in the

avoidance of incompatibility. Matters of therapeutics and of pharmacology find no places in these pages. Practical needs have been allowed to determine both the scope of the presentation and the degree of detail with which any phase of the subject is considered.

The official drugs and preparations used in prescription writing are those which are described in the Pharmacopœia and, in this country, in the National Formulary. It is well to have a clear idea at the start of the scope of these works.

A pharmacopœia is a book containing a list of drugs and formulas, and directions for the preparation of medicines.

The **Pharmacopœia of the United States**, or **The Pharmacopœia**, is a book of drugs and formulas, containing directions for the preparation of galenicals, and includes descriptions of mineral, vegetable, and animal drugs, together with tests for establishing the identity and quality of these, and with specifications as to the purity and strength of drugs.

The title is commonly abbreviated to U.S.Ph. or U.S.P.

The U.S.P. is revised and published decennially by a committee of revision, which is appointed by a national convention composed of representatives from medical and pharmaceutic colleges and associations which have been incorporated for not less than five years prior to the meeting or which were represented at the previous convention, and by representatives of certain departments of the Government. The

pharmacopœial convention meets decennially in Washington. Revision requires several years, and, therefore, the publication takes place from three to five, or more, years after the date of the convention, which is the date assigned to the revision. The latest meeting of the convention was held in 1920, and the tenth revision then undertaken is now the official Pharmacopœia. Its title is abbreviated to U.S.P. X.

Each country has a pharmacopœia which serves as a standard within its realm, the British Pharmacopœia (B.P.) being the foreign one best known in this country.

The **National Formulary** is a book of formulas and drugs, mainly at one time included in the U.S.P. or the B.P. It is issued by a committee of revision appointed by the American Pharmaceutical Association, and its revision has been at irregular intervals. It is commonly referred to by the abbreviation N.F. The latest, and now current edition is the fifth (N.F. V). Henceforth revision will be made decennially at the same time as that of the Pharmacopœia.

Both the **United States Pharmacopœia** and the **National Formulary** are privately published and revised, but, by act of Congress, the last revision of each is adopted as the legal standard for the preparation and purity of the contained drugs. It was the Food and Drugs Act of June 30, 1906, which first placed the National Formulary on the same legal basis as the Pharmacopœia. This is the act commonly known as the "Pure Food Law."

Drugs and preparations which are included in either the U.S.P. or the N.F. are spoken of as **official**.

**Galenical** preparations are those which are made by physical as distinguished from chemic means, such as tinctures, infusions, etc. This distinction sharply separates them from such as are made synthetically.

## THE PRESCRIPTION

A prescription may be defined as: *A physician's written order for one or more medicinal agents, together with his directions to the pharmacist for their preparation, and to the patient for their use.* This definition covers the meaning of the word in its narrower sense—that in which we shall use it in the succeeding pages. In its broad sense the term includes any recommendation, written or verbal, by a physician to a patient for any remedial measure—medicinal, dietary, physical exercise, change of climate, etc.

A complete prescription should include the following parts, arranged as shown:

1. SUPERSSCRIPTION.. R.
2. INSCRIPTION..... { Name of basis.....amount  
Name of adjuvant..amount  
Name of corrective..amount  
Vehicle.....amount
3. SUBSCRIPTION..... Mix, etc.
4. SIGNATURA..... Sig: Take one teaspoonful after each meal.
5. Name of patient.. Mr. Smith.\*
6. Name of prescriber..... J. Medicus, M.D.
7. Date..... April 4, 1912.\*

\* One may use his own preference in the location of the name of the patient and the date. Many prefer to place one or both above the body of the prescription.

1. The **superscription** is the primary order. It is written *R.*, and is the abbreviation of the Latin word *recipe*, which means *take* (thou). It is a command, and has as its object the quantities of the drugs mentioned in the inscription.

2. The **inscription** is the body of the prescription, and is composed of the official names of the drugs which are to be used, along with those of such solvents, diluents, coloring or flavoring agents, or other vehicle as may be requisite or desired for the perfection of the preparation.

3. The **subscription** comprises the necessary directions to the pharmacist for the proper preparation or compounding of the several ingredients for use by the patient.

The inscription and the subscription may be written either in Latin or in English, as the prescriber prefers. Whichever language is chosen must be used exclusively for *both* these parts of the prescription.

4. The **signatura** gives the necessary directions to the patient for his use of the preparation. These directions should include the size of the dose, the frequency of its repetition, the necessity for its dilution or other modification, and such other information as may be needed to guide the patient in its safe and proper use. The signatura invariably should be written in full detail in English in the form in which it is intended to appear upon the label, on to which the pharmacist should copy it verbatim.

In the prescription the signatura is usually indicated by the word: *Label*, when writing in

English, or by either of the following abbreviations of the Latin word *signa*: S., Sig.,—of these, the latter is to be preferred. Certain well-known abbreviations are frequently employed in the writing of the signatura, and, while their use is not strictly correct, custom and facility combine to render such a practice permissible. These abbreviations will be found in a table given in Chapter II.

While the two succeeding chapters will be devoted to a brief presentation of the writing of prescriptions in simplified Latin form, it must be said with a sense of satisfaction that there is a growing tendency to encourage their writing entirely in English. The use of English is unquestionably simpler and easier than that of Latin and there is less likelihood that the resulting prescription will be marred by grammatical errors. However, whether one elects to employ English or not, it is still necessary that the educated physician have a sufficient degree of familiarity with prescription Latin to be able to read prescriptions written in Latin with ease and accuracy.



## CHAPTER II

### LATIN GRAMMAR

WHEN the principal portions of the prescription are written in Latin, some knowledge of Latin grammar becomes an essential prerequisite. The grammar of the Latin language is both extensive and complex, but for the needs of prescription writing certain rudiments only are required, especially in the present day of simple prescriptions. An effort has been made in this chapter to select and present, in a simple and concise manner, all that is essential as a working basis. While a sharp limitation has been placed upon what has been chosen, it is believed that the limits have been wide enough to serve practically all the needs of the practitioner. To those who already have a good knowledge of Latin, much will appear to be quite unnecessary, but to him who knows nothing of the language, there is little which will be found to be superfluous. For a more detailed and more comprehensive presentation of the Latin grammar the reader is referred to Howe's and Beard's *Latin for Pharmacists* or Robinson's *Latin Grammar of Pharmacy and Medicine*. No definitions will be given of such terms as are common in the grammar of the English language, and brief ones only of those peculiar to the Latin.

The use of Latin in the prescription has been preserved by many, and for several reasons, among which may be mentioned: That it is the language of scientific nomenclature; being a dead language, it is less liable to alteration than are the modern languages; it is fairly widely understood; it is the language of pharmacopeial nomenclature, and, as there is only one Latin official name for a given substance, confusion is not likely to occur.

### NOUNS

Latin has no article, and the declension of nouns is accomplished by changes in their terminations. There are six cases: the nominative, genitive, dative, accusative, ablative, and vocative. The dative and vocative may be omitted, as they are almost never used for prescription writing. The ablative is used but seldom, and it will be given in light-faced type in the paradigms which follow. These paradigms have been arranged so as to give the three most important cases first, and in heavy-faced type, to direct attention to their importance. The genitive of the Latin corresponds to the possessive of English; the accusative, to the English objective. In the absence of the article, definiteness or generality is usually determined by the context.

Gender in Latin does not follow the rules of sex closely, as in English. Many names of inanimate objects are either masculine or feminine. The gender of a noun is generally indicated by its ending. Indeclinable nouns are neuter.

Latin has five declensions and some indeclinable words. The declensions are determined by the final letter of the stem of the noun and by the case-ending of the genitive singular. The declension is accomplished by combining the stem with the proper terminations. When the stem ends in a consonant it is found by dropping the case ending of the genitive singular. When it ends in a vowel, it is found by substituting the characteristic vowel for the case-ending of the genitive singular. The termination is the case-ending which is to be added to the stem. In vowel-stems the vowel of the termination combines with the final vowel of the stem.

Plurals are seldom used in prescription writing except for pills, powders, etc.

### THE DECLENSIONS

**First Declension.**—Nouns in the first declension end in **a** or **e** in the nominative singular. They are of the feminine gender. Those ending in **e** are from the Greek.

#### PARADIGMS

Case	Singular	Plural	Singular	Plural
<i>Nom.</i>	mistura- <b>a</b>	mistur- <b>ae</b>	alo- <b>e</b>	Endings the
<i>Gen.</i>	mistur- <b>ae</b>	mistur- <b>arum</b>	alo- <b>es</b>	same as for
<i>Acc.</i>	mistur- <b>am</b>	mistur- <b>as</b>	alo- <b>en</b>	nouns in- <b>a</b> .
<i>Abl.</i>	mistur- <b>a</b>	mistur- <b>is</b>	alo- <b>e</b>	

The important endings of the first declension are:

	Singular	Plural
Nouns in - <b>a</b>	Nouns in - <b>e</b>	Both nouns
<i>Nom.</i>	- <b>a</b>	- <b>ae</b>
<i>Gen.</i>	- <b>ae</b>	- <b>arum</b>
<i>Acc.</i>	- <b>am</b>	- <b>as</b>
<i>Abl.</i>	- <b>a</b>	- <b>is</b>

**Second Declension.**—Masculine nouns in the second declension end in the nominative singular in **-us** (except names of trees,\* which are feminine), **-er**, and **-os**; the neuter in **-um** and **-on**. Those ending in **-os** and **-on** are from the Greek. Those ending in **-er** are irregular in the nominative singular only and are declined like those in **-us**. Those ending in **-os** form the accusative singular in **-on**, otherwise being declined like those in **-us**.

## PARADIGMS

		<i>Singular</i>	
Ending in: <b>-us</b>		<b>-um</b>	<b>-on</b>
<i>Nom.</i>	syrup-us	acid-um	haematoxyl-on
<i>Gen.</i>	syrup-i	acid-i	haematoxyl-i
<i>Acc.</i>	syrup-um	acid-um	haematoxyl-on
<i>Abl.</i>	syrup-o	acid-o	haematoxyl-o
		<i>Plural</i>	
Ending in: <b>-us</b>		<b>-um</b>	<b>-on</b>
<i>Nom.</i>	syrup-i	acid-a	Plural the same as
<i>Gen.</i>	syrup-orum	acid-orum	in the case of
<i>Acc.</i>	syrup-os	acid-a	nouns ending in
<i>Abl.</i>	syrup-is	acid-is	<b>-um</b> .

The important endings of the second declension are:

		<i>Singular</i>		<i>Plural</i>	
Ending in:		<b>-us</b>	<b>-um</b>	<b>-on</b>	<b>-us</b> <b>-um and -on</b>
<i>Nom.</i>		<b>-us</b>	<b>-um</b>	<b>-on</b>	<b>-i</b> <b>-a</b>
<i>Gen.</i>		<b>-i</b>	<b>-i</b>	<b>-i</b>	<b>-orum</b> <b>-orum</b>
<i>Acc.</i>		<b>-um</b>	<b>-um</b>	<b>-on</b>	<b>-os</b> <b>-a</b>
<i>Abl.</i>		<b>-o</b>	<b>-o</b>	<b>-o</b>	<b>-is</b> <b>-is</b>

**Third Declension.**—Nouns in the third declension vary greatly in their nominative forms, and for the determination of their declension it is

\* These nouns are declined like the common masculine nouns ending in **us**, but adjectives which modify them must have the feminine form, as: *Prunus Virginiana*. The commoner examples of these nouns are: juniperus, prunus, rhamnus, sambucus, and ulmus.

necessary to know both the nominative and the genitive singular cases. In general, the consonant stems may be found by dropping the case-ending of the genitive singular. Masculine and feminine are declined alike; the neuter differs somewhat from these.

## PARADIGMS

	<i>Singular</i>		<i>Plural</i>	
	<i>Masculine</i>	<i>Neuter</i>	<i>Masculine</i>	<i>Neuter</i>
<i>Nom.</i>	aceta-s	lac	acetat-es	lact-a
<i>Gen.</i>	acetat-is	lact-is	acetat-um	lact-um
<i>Acc.</i>	acetat-em	lac	acetat-es	lact-a
<i>Abl.</i>	acetat-e	lact-e	acetat-ibus	lact-ibus

The important endings of the third declension are:

	<i>Singular</i>		<i>Plural</i>	
	<i>Masculine and Feminine</i>	<i>Neuter</i>	<i>Masculine and Feminine</i>	<i>Neuter</i>
<i>Nom.</i>	-(s)*	-	-es	-a
<i>Gen.</i>	-is	-is	-um	-um
<i>Acc.</i>	-em	-	-es	-a
<i>Abl.</i>	-e	-e	-ibus	-ibus

NOTE.—While there are many stems in the third declension other than those already indicated, for the purposes of this presentation it will suffice to give the above only, as, regardless of the stem, the case-endings remain the same.

The gender of nouns in the third declension follows certain general rules: 1. Nouns ending in **-or** are masculine. 2. The names of acid radicals ending in **-as** and **-is** are masculine. 3. Nouns ending in **-as**, **-is** or **-x**, and **-io** are usually feminine. Some of those ending in **-is** do not change in the genitive singular, others lengthen.

\* The **s** is added in the nominative in the case of nouns the stems of which are mute.

Those ending in **-x** have stems ending in **c**, and where **e** precedes the **x** it is changed to **i** in cases other than the nominative. 4 Nouns ending in **-ol** or **-ma** are neuter, the latter being of Greek origin. 5. An exception to the rule for feminines is *cortex*, which is masculine.

## PARADIGM

	<i>Singular</i>	<i>Plural</i>
<i>Nom.</i>	<b>theobroma</b>	<b>theobromat-a</b>
<i>Gen.</i>	<b>theobromat-is</b>	<b>theobromat-um</b>
<i>Acc.</i>	<b>theobroma</b>	<b>theobromat-a</b>
<i>Abl.</i>	<b>theobromat-e</b>	<b>theobromat-ibus (-is)</b>

(The stems of these Greek nouns end in **t-**.)

**Fourth Declension.**—The nouns of the fourth declension are masculine and have stems ending in **-u**. They are very few in number in medicine.

## PARADIGM

	<i>Singular</i>	<i>Plural</i>
<i>Nom.</i>	<b>spiritu-s</b>	<b>spiritu-s</b>
<i>Gen.</i>	<b>spiritu-s</b>	<b>spiritu-um</b>
<i>Acc.</i>	<b>spiritu-m</b>	<b>spiritu-s</b>
<i>Abl.</i>	<b>spiritu</b>	<b>spirit -ibus</b>

The nouns of this declension commonly used in prescription writing are:

fructus	fruit
haustus	drink, draught
potus	drink
quercus	oak
spiritus	spirit

(The word *potio*, *potionis*, in the third declension is also used to mean drink.)

**Fifth Declension.**—Practically the only nouns of the fifth declension which are in common use in prescription writing are **species** and **dies**.

The word for day, *dies*, is masculine. All the other nouns in the fifth declension are feminine.

### PARADIGM

	<i>Singular</i>	<i>Plural</i>
<i>Nom.</i>	<b>dies</b>	<b>dies</b>
<i>Gen.</i>	<b>diei</b>	<b>dierum</b>
<i>Acc.</i>	<b>diem</b>	<b>dies</b>
<i>Abl.</i>	<b>die</b>	<b>diebus</b>

Nouns are governed as to case by the grammatic construction of the sentence and by certain prepositions. Some idiomatic expressions also require the use of a specific case.

The number of nouns which occur as names of the official drugs and preparations is limited, and, for the sake of further aiding the student, the following general rules may be given to cover the two most commonly used cases, the genitive and the accusative:

### GENERAL RULES FOR THE FORMATION OF THE GENITIVE CASE

1. Nouns ending in **a** in the nominative singular form the genitive singular in **ae**.

Exceptions are: The Greek nouns ending in **-ma**, and **folia**, which is nominative plural; gen. **foliorum**.

2. Nouns ending in **-us**, **-um**, **-os**, **-on** in the nominative singular form the genitive singular in **-i**.

The following are exceptions: The third declension nouns: **rhus**, gen. **rhois**; **flos**, gen. **floris**; **erigeron**, gen. **erigerontis**; and those belonging to the fourth declension, which do not change in the genitive.



3. Other nouns, regardless of the ending in the nominative singular, form the genitive in **-s** or **-is**. In some the termination is lengthened, thus:

Ending in <b>-as</b> ,	gen. <b>-atis</b>	as <b>acetas</b>	gen. <b>acetatis</b>
“ “ <b>-is</b> ,	“ <b>-idis</b>	“ <b>anthemis</b>	“ <b>anthemidis</b>
“ “ <b>-o</b> ,	“ <b>-onis</b>	“ <b>pepo</b>	“ <b>peponis</b>
“ “ <b>-x</b> ,	“ <b>-cis</b>	“ <b>cortex</b>	“ <b>corticis</b>

Other examples are: **asclepias**, gen. **asclepiadis**; **mas**, gen. **maris**; **phosphis**, **sulphis**, etc., gen. **phosphitis**, **sulphitis**, etc.; **mucilago**, gen. **mucilaginis**; **pulvis**, gen. **pulveris**, etc.

4. The following official names do not change in the genitive singular: **Cannabis**, **coptis**, **digitalis**, **hydrastis**, **hypophysis** and **sinapis**, and the nouns of the fourth declension.

#### GENERAL RULES FOR THE FORMATION OF THE ACCUSATIVE CASE

1. Nouns ending in **-a** in the nominative singular form the accusative singular in **-am**; the accusative plural, in **-as**.

2. Nouns ending in **-us** in the nominative singular form the accusative singular in **-um**; the accusative plural, in **os**; except the members of the fourth declension, which do not change in the accusative plural.

3. Nouns ending in **-um** in the nominative singular form the accusative singular in **-um**; the accusative plural, in **-a**.

4. Nouns ending in **-is** in the *genitive singular* form the accusative singular in **-em**; the accusative plural, in **-es**.

## INDECLINABLE

The following nouns of neuter gender are regarded as being indeclinable: Agar-agar, buchu, cajuputi, condurango, curare, cusso, diachylon, gambir, gummi, jaborandi, kava, kino, kola, matico, paracoto, sabal, sago, sassafras, sumbul, and tolu. The word **alcohol** is commonly regarded as indeclinable, by others it is placed in the third declension.

It will be of further help to the student to know that more than three-fourths of all official names are included in two declensions:

1. The following general classes of preparations have names ending in **-a** in the nominative singular and belong to the first declension:

Alkaloids  
Masses  
Mixtures  
Oleoresins

Pastes  
Pills  
Resins  
Tinctures

Waters

2. The following have names ending in **-us** in the nominative singular and belong to the second declension:

Syrups

Troches

3. The following end in **-um** and belong to the second declension:

Acids  
Decoctions  
Emulsions  
Extracts  
Fluidextracts  
Fluidglycerates  
Glycerites  
Hydroxides  
Infusions

Liniments  
Metals  
Oils, fixed and volatile  
Ointments  
Oleates  
Plasters  
Salts of the halogens  
Serums  
Vinegars

Wines

## ADJECTIVES

Adjectives agree in number, gender and case with the nouns which they modify. They are declined as are nouns, and belong either to the first and second, or to the third declension.

Adjectives of the first and second declensions end, when masculine, in **-us** or **-er**; when feminine, in **-a**; and when neuter, in **-um**. They are declined like nouns of the corresponding gender having similar endings; the masculine, like *syrupus*; feminine, like *mistura*; and neuter, like *acidum*. Those ending in **-er** change the **-er** to **r** and add the case endings.

Adjectives of the third declension ending in **-is** are masculine or feminine, those in **-e** are neuter. They are declined as follows:

## PARADIGM

	<i>Singular</i>		<i>Plural</i>	
	<i>Masculine and Feminine</i>	<i>Neuter</i>	<i>Masculine and Feminine</i>	<i>Neuter</i>
<i>Nom.</i>	mit-is	mit-e	mit-es	mit-ia
<i>Gen.</i>	mit-is	mit-is	mit-ium	mit-ium
<i>Acc.</i>	mit-em	mit-e	mit-es	mit-ia
<i>Abl.</i>	mit-i	mit-i	mit-ibus	mit-ibus

Adjectives of the third declension ending in **-ns** are frequent in pharmaceutical Latin. They are present participles of verbs, and they are declined as follows:

## PARADIGM

	<i>Singular</i>		<i>Plural</i>	
	<i>Masculine and Feminine</i>	<i>Neuter</i>	<i>Masculine and Feminine</i>	<i>Neuter</i>
<i>Nom.</i>	bullien-s	bullien-s	bullient-es	bullient-ia
<i>Gen.</i>	bullient-is	bullient-is	bullient-ium	bullient-ium
<i>Acc.</i>	bullient-em	bullien-s	bullient-es	bullient-ia
<i>Abl.</i>	bullient-i	bullient-i	bullient-ibus	bullient-ibus

Numeral adjectives belong to the same three declensions as do adjectives in general. But the cardinals above *tres* are indeclinable, except multiples of *centum*. As they are seldom, if ever, used in prescription writing, being expressed always by the Roman or Arabic characters, it is not necessary to discuss them in this place.

The comparison of adjectives also does not, in general, concern us in the writing of prescriptions, and the few instances in which forms other than the positive are used will be learned quite readily as they are encountered.

The comparatives, ending in **-ior** (masculine and feminine) and **-ius** (neuter), are declined as adjectives of the third declension.

## PARADIGM

	<i>Singular</i>		<i>Plural</i>	
	<i>Masculine and Feminine</i>	<i>Neuter</i>	<i>Masculine and Feminine</i>	<i>Neuter</i>
<i>Nóm.</i>	<b>fortior</b>	<b>fortius</b>	<b>fortior-es</b>	<b>fortior-a</b>
<i>Gen.</i>	<b>fortior-is</b>	<b>fortior-is</b>	<b>fortior-um</b>	<b>fortior-um</b>
<i>Acc.</i>	<b>fortior-em</b>	<b>fortius</b>	<b>fortior-es</b>	<b>fortior-a</b>
<i>Abl.</i>	<b>fortior-e</b>	<b>fortior-e</b>	<b>fortior-ibus</b>	<b>fortior-ibus</b>

## VERBS

Verbs in Latin are conjugated, as are verbs in English, and their conjugations are quite complex. For the purposes in hand the matter of conjugation may be much simplified and reduced to the learning of a few forms only, with their meanings and modes of use in grammatic construction. We may also limit the number of conjugations to be considered to the first three of the regular verbs.

The regular verbs are distinguished as to conjugation by the vowel which precedes the **-re** in

the ending of the present infinitive of the active voice, thus:

<i>Conjugation</i>	<i>Infinitive Ending</i>	<i>Characteristic Vowel</i>
<i>First</i>	<b>-are</b>	<b>a</b>
<i>Second</i>	<b>-ere</b>	<b>e</b> (long)
<i>Third</i>	<b>-ere</b>	<b>e</b> (short)

(The principal parts of a verb are the present indicative, present infinitive, perfect indicative, and the supine or perfect participle. They are called the principal parts because they serve to give the stems from which the full conjugation of the verb can be derived. The present indicative gives the form of the present stem; the present infinitive gives the future and subjunctive stems and indicates the conjugation to which the verb belongs. For medical uses in the writing of prescriptions it is sufficient to know the present stem and the conjugation to which the verb belongs.)

### FORMS OF VERBS IN USE

For the purposes of prescription writing practically the only forms of the verbs which are used at present are:

1. The second person, singular number, present tense of the imperative mode in the active voice. It is found by dropping the **-re** of the present infinitive and is identical with the present stem. It is translated as a direct command, thus: *recipe pilulas*, take the pills. The noun is the object of the verb and is to be expressed in the accusative case.

2. The third person, singular or plural, of the present subjunctive in the active voice. It

is characterized by the final **-t** in the singular and final **-nt** in the plural. This is also translated as a command, thus: *mistura colet*, let the mixture strain, or *misturæ colent*, let the mixtures strain. The verb agrees with the noun in number. The noun is the subject of the verb and is therefore expressed in the nominative case. These active forms of the subjunctive are infrequently used, the imperative mode being preferred.

3. The third person, singular or plural, of the present subjunctive in the passive voice. It is characterized by the final **-tur** in the singular and final **-ntur** in the plural. The usage is again that of a command, thus: *tinctura addatur*, let the tincture be added, or *tincturæ addantur*, let the tinctures be added. As in the preceding the noun is the subject and is in the nominative case. The verb agrees with the noun in number.

While the subjunctive forms are characterized by the endings stated, the vowel which precedes these endings differs according to the conjugation of the verb. The complete subjunctive terminations for the forms used are given in the following table for each of the four regular conjugations:

### SUBJUNCTIVE ENDINGS

Third person, present tense.

Conjugation	<i>Active voice</i>		<i>Passive voice</i>	
	<i>Singular</i>	<i>Plural</i>	<i>Singular</i>	<i>Plural</i>
1	<b>-et</b>	<b>-ent</b>	<b>-etur</b>	<b>-entur</b>
2	<b>-eat</b>	<b>-eant</b>	<b>-eatur</b>	<b>-eantur</b>
3	<b>-at</b>	<b>-ant</b>	<b>-atur</b>	<b>-antur</b>
4	<b>-iat</b>	<b>-iant</b>	<b>-iatur</b>	<b>-iantur</b>

The third conjugation verb, *capio*, takes the endings of the verbs of the fourth conjugation in the subjunctive modes, both active and passive.

### FACIO AND FIO

The verb *facio*, I make, belongs to the third conjugation. It is irregular and has the form **fac** for the second person, singular, present imperative in the active voice.

The verb *fio* is used as the passive voice for *facio* and is translated *be made*. The third person in the present subjunctive is **fiat**, let (it) be made, in the singular number and **fiant**, let (them) be made, in the plural.

### SUBJUNCTIVE WITH UT

**Ut** is used as a conjunction with the subjunctive mode to express purpose, as: *Adde aquam ut solutio fiat*—add water that a solution be made. In this construction it is customary to place the name of the preparation between the word *ut* and the verb.

In the following table the several parts of the verbs most commonly used in the writing of prescriptions are given, showing the forms for each of the three commonly used conjugations. From the table, the corresponding forms of the other verbs which may be used can readily be derived when the conjugation is known.

The following list of verbs will be found to cover most of the needs of the prescriber. The arrangement is according to conjugation, and is alphabetic for each conjugation.



TABLE OF PRINCIPLE PARTS OF VERBS COMMONLY USED IN PRESCRIPTION WRITING

CONJUGATION	ACTIVE VOICE				PASSIVE VOICE	
	Present Indicative First Person Singular	Present Imperative Second Person Singular	Present Subjunctive		Present Subjunctive	
			Third Person Singular	Third Person Plural	Third Person Singular	Third Person Plural
First..... {	Do Pulvero	Da Pulvera	Det Pulveret	Dent Pulverent	Detur Pulveretur	Dentur Pulverentur
Second.....	Misceo	Misce	Misceat	Misceant	Misceatur	Misceantur
Third	Divido	Divide	Dividat	Dividant	Dividatur	Dividantur

## VERBS USEFUL IN PRESCRIPTIONS

## First conjugation:

<i>Verb</i>	<i>Meaning</i>
Agito.....	shake
Colo.....	strain
Coloro.....	color
Do.....	give
Filtro.....	filter
Macero.....	macerate, soak, soften by soaking
Pulvero.....	powder, reduce to powder
Sto.....	stand
Trituro.....	triturate, reduce to powder

## Second conjugation:

<i>Verb</i>	<i>Meaning</i>
Misceo.....	mix

## Third conjugation:

<i>Verb</i>	<i>Meaning</i>
Addo..	add
Capio.....	take
Conspergo.....	sprinkle, coat
Divido.....	divide
Mitto.....	send
Obduco.....	coat, cover
Pono.....	place, put
Recipio.....	take
Repeto.....	repeat
Solvo.....	dissolve
Sufficio.....	suffice
Tero.....	rub

## PREPOSITIONS

Latin has a number of prepositions, and their use is accompanied by a modification of the case of the nouns which they govern. Prepositions indicate the relation of objects one to another.

Only those employed in prescriptions will be given.

The following prepositions govern the accusative case:

Ad.....	to, up to
Ante.....	before
In.....	into
Post.....	after
Secundum.....	according to

The following prepositions govern the ablative case:

Cum.....	with
In.....	in, on
Pro.....	according to, for
Sine.....	without

**Ana** is a preposition meaning *of each*, and it governs the genitive case. It is transferred from the Greek.

### CONJUNCTIONS

Practically the only conjunctions which are likely to be of use to the prescriber are: **vel**, meaning *or*; and **et**, meaning *and*. Their construction is the same as in English.

### ADVERBS

Adverbs are used so seldom in prescriptions that a special consideration of them is not needed. Such as are used will be readily learned as they are encountered.

## WORDS AND PHRASES

Certain words and phrases recur frequently in the writing of prescriptions. These may preserve their original and strict Latin meanings, but in many instances they are used idiomatically, or are translated rather freely in their use in prescriptions. It will be advantageous to present these words and phrases in the form of a table (pp. 42-44), in which their common meanings in prescription usage, as well as their more or less literal meanings, will be given. For the sake of better understanding, some points in the Latin grammar of each will also be included.

## ABBREVIATIONS

Accuracy is very important in the writing of prescriptions. The use of abbreviations tends to the development of inaccuracy on the part of the prescriber, and leaves room, in many cases, for errors in interpretation on the part of the pharmacist. Nevertheless, there are certain abbreviations which are so well known that their use is permissible. The following is a list of those in common use. In addition to these both the Pharmacopœia and National Formulary have adopted official abbreviations for all titles. It is not, however, recommended that these be used in place of the full titles.

## COMMON ABBREVIATIONS

ABBREVI- ATION	UNABBREVIATED FORM	MEANING
āā.....	ana.....	of each.
a.c.....	ante cibum.....	before meals.
ad lib.....	ad libitum.....	freely.
aq.....	aqua.....	water.
aq. bul.....	aqua bulliens.....	boiling water.
aq. dest.....	aqua destillata.....	distilled water.
aq. ferv.....	aqua fervens.....	hot water.
aq. font.....	aqua fontana.....	spring water.
b.i.d.....	bis in die.....	twice a day.
chart.....	chartula.....	a powder.
co., comp...	compositus.....	compound.
dil.....	dilutus.....	dilute.
Ext.....	extractum.....	extract.
F., ft.....	fac, fiat or fiant.....	make, let it be made, let them be made.
Flext.....	fluidextractum.....	fluidextract.
gtt.....	gutta.....	drop.
M.....	misce.....	mix.
mist.....	mistura.....	mixture.
no.....	numerus, numero...	number, to the number of
pil.....	pilula.....	pill.
p.r.n.....	pro re nata.....	according to necessity.
pulv.....	pulvis.....	powder.
q.s.....	quantum satis, sufficit or sufficiat.....	as much as necessary.
sat.....	saturatus.....	saturated.
ss.....	semisse.....	(and) a half.
S., Sig.....	signa.....	label.
sol.....	solutio.....	solution.
s.o.s.....	si opus sit.....	if necessary.
stat.....	statim.....	at once.
syr.....	syrupus.....	syrup.
Tr.....	tinctura.....	tincture.
t.i.d.....	ter in die.....	three times a day.
ungt.....	unguentum.....	ointment.

## TABLE OF COMMON WORDS AND PHRASES

WORD OR PHRASE	COMMON MEANING	LITERAL MEANING	LATIN GRAMMAR
Ad libitum.....	at pleasure, freely.....	at pleasure.....	ad with the accusative.
Aequalis.....	equal.....	equal.....	adjective.
Aqua bulliens.....	boiling water.....	boiling water.....	noun, modified by adjective <i>bulliens</i> , present participle of <i>bullio</i> .
Aqua fervens.....	hot water.....	hot water.....	similar to the preceding. <i>Fervens</i> , from <i>ferveo</i> .
Aqua fontana.....	spring water.....	spring water.....	noun with adjective.
Aqua destillata.....	distilled water.....	distilled water.....	<i>destillata</i> , perfect participle, passive voice of <i>destillo</i> .
Bene.....	well.....	well.....	an adverb.
Bis in die.....	twice daily.....	twice in a day.....	<i>bis</i> , an adverb meaning twice; <i>in die</i> , in with the ablative (often also written as "bis in dies").
Cacheta.....	cachet.....	cachet.....	noun.
Capsula mollis.....	soft capsule.....	soft capsule.....	noun (feminine) with adjective.
Charta.....	a medicated paper.....	paper.....	noun; used idiomatically to mean a medicated paper, in contrast to <i>chartula</i> .
Chartula.....	a powder.....	little paper.....	noun; the name of the container is used here to indicate the thing contained. The word powder is used in the sense of a measured dose of a drug in powdered form. Contrast with <i>pulvis</i> .
Cibus.....	a meal.....	food.....	noun; usually used in a phrase with <i>ante</i> or <i>post</i> and the accusative.
Collyrium.....	eye-wash.....	liquid eye-salve.....	noun.
Dosis.....	a dose.....	a dose.....	noun.

Gargarisma.....	a gargle.....	noun.
Gutta.....	a drop.....	noun.
Hautus.....	a draught.....	noun.
Hora.....	hour.....	noun.
Mane.....	morning.....	noun, indeclinable.
Ne repetatur.....	do not repeat.....	let it not be repeated. <i>ne</i> , meaning not with the third person singular, present subjunctive passive voice of <i>repeto</i> .
Non.....	not.....	adverb.
Nox.....	night.....	noun.
Numero.....	number.....	to the number of..... noun, ablative of specification.
Omnis.....	every.....	adjective, used in the ablative to indicate time when, as with <i>nox</i> , <i>mane</i> , <i>hora</i> , etc.
Ovum.....	egg.....	noun.
Pars.....	a part.....	noun.
Pilula.....	pill.....	noun.
Pro re nata.....	according to necessity.....	a phrase; <i>pro</i> , a preposition meaning according to, with the ablative <i>re</i> , from <i>res</i> , meaning circumstance or condition, modified by the adjective <i>nata</i> , which is the ablative of the perfect participle of <i>nascor</i> (I arise).
Pulvis.....	powder.....	noun; refers to the physical state of the substance. Cf. <i>chartula</i> .
Quantum satis.....	as much as necessary.....	a sufficient quantity... <i>quantum</i> , adjective meaning as much (as); with <i>satis</i> , an adverb meaning enough. The phrase is followed by the genitive case.

## TABLE OF COMMON WORDS AND PHRASES—(Continued)

WORD OR PHRASE	COMMON MEANING	LITERAL MEANING	LATIN GRAMMAR
Quantum sufficit....as much as is necessary.....	as much as suffices....	<i>quantum</i> , an adjective meaning as much (as); <i>sufficit</i> , third person singular, present indicative of the active voice, from <i>sufficio</i> . The phrase is followed by the genitive (partitive).	
Quantum sufficiat...a sufficient quantity...	as much as may suffice.	here the verb is in the subjunctive to express a condition to be fulfilled. Also takes genitive case.	
Quaque hora.....	every hour.....	<i>quaque</i> , from <i>quisque</i> , every (one), in the ablative, with <i>hora</i> , to express time when.	
Secundum artem.....	appropriately.....	according to the art....	
Semisse.....	and a half.....	ablative from <i>semis</i> , <i>cum</i> (with) being understood. Used with numerals and abbreviated ss.	
Si opus sit.....	if necessary.....	if there be need.....	<i>si</i> , a conjunction meaning if, with <i>opus</i> , a noun, meaning need (in the nominative as the subject of the subjunctive); <i>sit</i> , the third person singular, subjunctive, from <i>sum</i> (I am), meaning be there, or (if) there be.
Statim.....	at once.....	at once.....	adverb of time.
Talis, —e.....	such.....	such.....	adjective.
Tere simul.....	rub together.....	rub together.....	<i>tere</i> , imperative from <i>tero</i> , with the adjective <i>simul</i> , meaning together.
Ter.....	three times.....	three times.....	adverb, usually used in the phrase <i>ter in die</i> —three times daily. See <i>bis</i> .
Vitellus.....	yolk of an egg.....	yolk.....	noun.



## CHAPTER III

### GRAMMATIC CONSTRUCTION OF THE PRESCRIPTION

THE official Latin names of drugs and preparations constitute the major portion of a modern prescription which is written in Latin. It will, therefore, be helpful to precede the discussion of the grammatic construction of the prescription by a few notes upon the general types into which they fall, the methods of naming employed and to state two general rules which bear upon their declension. The general types given below do not include all official preparations, but the small number of exceptions can be learned readily as they are encountered.

**Official Latin Titles.**—These can be grouped under five general types:

1. A noun with one or more adjectives, all in the nominative case and agreeing in gender and number. Eg.; *Acidum hydrochloricum*, *Acidum Hydrochloricum Dilutum*.

2. A noun modified by another noun. The modifying noun is in the genitive case in accordance with the rule stated below, the noun which is modified is in the nominative. Eg.; *Tinctura Opii*.

3. Similar to No. 2 with an adjective modifying one of the nouns, and agreeing with it in

number, gender and case. Eg.; *Tinctura Opii Camphorata*, *Sodii Phosphas Exsiccatus*.

4. Titles containing two nouns connected by the conjunction *et*. The two nouns thus connected are in the same case. Eg.; *Bismuthi et Sodii Tartras*.

5. Titles containing two nouns connected by a preposition. The noun which follows the preposition is governed by it and is therefore expressed in the appropriate case. Eg.; *Hydrargyrum cum Creta*.

**Capitalization of Words in Official Titles.**—Capitals are used throughout all official titles for all of the important words. Prepositions and conjunctions are practically the only words not capitalized. In writing prescriptions the official method of capitalization should be preserved.

**Order of Words in Official Titles.**—

1. In the case of official acids the word *acidum* precedes the name of the acid. Eg.; *Acidum Boricum*.

2. In the case of official salts the name of the base precedes that of the acid, and is expressed in the genitive case. Eg.; *Sodii Chloridum*.

3. In galenical preparations the name of the preparation precedes that of the drug, or drugs, from which it is made. Eg.; *Extractum Rhei*.

4. In titles containing a noun modified by an adjective the noun precedes the adjective. Eg.; *Santalum Rubrum*, *Sodii Arsenas Exsiccatus*, *Pulvis Rhei Compositus*.

**Rules.—**

1. *In compound names, in which one noun qualifies another, the qualifying noun is expressed in the genitive case.* Eg.; *Tinctura Nucis Vomicae*; where the name of the preparation, *tinctura*, is qualified by the name of the drug, *nux vomica*.

2. *In declining compound names, like those of the official titles, only those words which are in the nominative case are declined.* All others retain the original case throughout.

The prescription has been defined, its several parts mentioned, and the rudiments of Latin grammar discussed, so that we are now in a position to enter in some detail into a consideration of the grammatic construction of the prescription.

The superscription and the inscription together form a sentence which is a command. The verb is expressed but once, and is understood as referring to each of the several objects specified in the inscription, thus:

℞. Acetanilidi.....grana tria  
Sodii Bicarbonatis.....grana decem

Which is to be translated, “take (thou) three grains of acetanilid; take (thou) ten grains of sodium bicarbonate,” or the conjunction *and* may be understood, thus “take three grains of acetanilid and ten grains of sodium bicarbonate.”

1. **The Superscription.**—The word *recipe* is the second person, singular number, present tense, of the imperative mode of the verb *recipio* (I take). This is common to all prescriptions.

**2. The Inscription.**—This is peculiar to the individual prescription, but its general characters are common to the greater number of all prescriptions. It contains the object, or objects, of the command, “take.” In the majority of prescriptions this object is the *unit of measure* of the drug (or drugs) which is to be taken; *e.g.*, grain, ounce, gram, etc. This is to be expressed in the accusative case, being the object of an active transitive verb. In practice, however, the unit is not written out, but is expressed by the appropriate symbol or abbreviation.

As adjectives agree with their nouns in number, gender, and case, the numerical adjectives which modify the units of measure are also expressed in the accusative case; *e.g.*, unciam *unam*, grana *tria*, etc. Here again the word is seldom, if ever, written out, the adjective being expressed by the appropriate Roman or Arabic numerals.

*The official Latin name of the drug, or preparation, of which the amount specified is to be taken, is expressed in the genitive case.* The use of the genitive for the name of the drug or its preparation is the general one, and applies to all cases in which the quantity is specified by weight or measure. Such use of the genitive is termed the *partitive genitive*, as it indicates the substance of which a part is to be taken.

The modifying adjectives which are used in the official names of drugs are to be expressed in the genitive case, agreeing also with their nouns in number and gender, *e.g.*,

R̄. Pulveris Morphinæ *Compositi* . . . . . gr. v

When a preparation of a drug is employed, *e.g.*, the tincture, the extract, etc., the name of the drug is already expressed in the genitive; for example, *tinctura nucis vomicæ*. In such cases the unit of measure refers to the preparation, and not directly to the drug; hence the name of the preparation (in the example—*tinctura*) is to be expressed in the genitive, as explained above.

The superscription and inscription may be analyzed thus:

Imperative verb. . *R*(ecipe)

		<i>Accusative case</i>
Partitive genitive.....	{	Codeinæ . . . . . gr. i. granum unum
		Acidi Phosphorici
		Diluti . . . . . ꝑ x. minima decem
		Syrupi Sarsaparillæ
		Compositi ꝑi . . drachmam unam

An *exception* to the use of the genitive case when expressing the ingredients of the prescription occurs in those instances in which *the name of a preparation is made the direct object of the verb "take,"* the name of the preparation being then expressed in the *accusative* case. Under these conditions the quantity is expressed as a numerical adjective modifying the name of the preparation, *e.g.*:

*R*. Pilulas Aloes et Ferri . . . . . ij (duas)

which is translated, "take two pills of aloes and iron." (*Aloes* and *ferri* remain in the genitive, in accordance with the rule covering the declension of compound names.) The same construction may be used also in the case of the vehicle or final

ingredient of an extemporaneous prescription,  
*e.g.*:

R̄. Sodii Bromidi..... gr. x  
 Aquam.....ad ℥j

The last line of this is translated: "Take water up to one drachm."

**3. The Subscription.**—This is a sentence apart from the one made up of the first two portions of the prescription. It is written in Latin, as previously stated, and should be expressed in the *simplest manner possible*. It comprises the directions to the pharmacist, and details of pharmaceutical procedure should, as a rule, be left to his discretion. In the present day of simplicity in prescriptions perhaps the readiest method of presenting the construction of the subscription is by means of a series of models which will cover most of the commoner needs. The grammar of each of these will be briefly discussed—just sufficiently for a clear and intelligent understanding of its use. These types may be modified to suit individual needs, but for the average the models given will probably be sufficient.

#### SUBSCRIPTION TYPES

**1. Misce** (imperative)—meaning "mix"—may be used alone in the case of a prescription the ingredients of which, when mixed, will make a solution or simple mixture, as in the case of dry powders. Where such is not the case, it is customary to state the nature of the preparation which is to result from the mixture of the in-

gredients. In all prescriptions, be they fluid, semisolid, or solid, in which there are two or more ingredients, this word or its abbreviation (M.) should precede any other orders which may be given in the subscription. Exceptions to this generalization are to be found in the cases of prescriptions which call for the making of such preparations as decoctions, infusions, and the like.

**2. Misce et fac Solutionem.**—"Mix and make a solution." This is the simplest and most direct form, both verbs being in the imperative mode. The name of the preparation which is to be made is the direct object of the verb and is to be expressed in the accusative case. This form of subscription may be used if one desires to call attention to the fact that he wishes the apothecary to prepare a solution. Some use it for any prescription which, when compounded, will make a solution. Others reserve its use for those cases in which an indefinite amount of solvent is ordered, or where no special solvent has been indicated, and the pharmacist is permitted to use his discretion as to quantity or type of solvent, or both. When another type of preparation, such as an emulsion, mixture, etc., is directed, its name may be used instead of the word *solutionem* without changing the construction. This should be done in every case in which a preparation other than a simple solution is desired. The following example illustrates the reason for this: A physician may order slightly more of a solid drug than

will completely dissolve in the solvent prescribed. If he is unaware of this fact and has directed the pharmacist to make a solution, the pharmacist may add some other solvent in just sufficient amount to complete the solution, or he may consult the physician before compounding the prescription and call his attention to the error. If, on the other hand, the prescription had specified a mixture, it would then have been evident that the prescriber had known the insolubility and had, nevertheless, desired the proportions specified.

**Misce et fiat**—"mix and let be made." *Ei* is a conjunction meaning *and*; *fiat* is the third person singular, present subjunctive. The name of the preparation is the subject of the subjunctive verb, and therefore is to be expressed in the nominative case. *Fiat* is used only when the name of the preparation is in the singular number. In the case of pills, powders, etc., where the name of the preparation is expressed in the plural, the third person plural of the verb is to be used, the form being *fiant*.

The expression *misce et fiat* (or *fiant*) is adaptable to the majority of the prescriptions which are written at the present time, but it is easier and more direct to use the imperative form.

**3. Fac or Fiat Decoctum.**—This subscription may be used in the case of decoctions or, if the word *infusum* be substituted, in the case of infusions. As the U.S.P. gives directions for the manufacture of these preparations, it is unnecessary for the prescriber to direct the details of



their preparation. The word *misce* is omitted from this form of subscription because the process is a special one and not one of simple admixture. The constructions are grammatically similar to those discussed under caption 2.

**4. Misce et Divide in**—This form may be used in the case of pills, powders, troches, etc., that is, where the prescription is to be divided into parts or doses and dispensed in such form. The name of the form in which the prescription is to be dispensed (pills, powders, etc.) is then to be expressed in the accusative case after the preposition *in*, meaning *into*. The construction of *divide* is the same as that of *misce* and has already been explained.

**5. Pone**, meaning “put” or “place,” may be substituted for *divide* in the preceding form. It is used in such prescriptions as call for the use of capsules, cachets, etc., that is, whenever the ingredients are to be put into containers in which they are to be taken. *Pone* may be used in the case of a single drug, the word *misce* then being omitted. *Fiat* and *fiant* are sometimes used when the prescription is to be dispensed in the form of one or more capsules, cachets, etc., but the use of *pone* is to be preferred.

**6. Tere** means “rub,” and is used in such prescriptions as require the mixture of their ingredients by rubbing, as in the making of ointments, pastes, etc. It may be combined with other orders, such as, **misce et tere bene**, “mix and rub or stir well,” etc. In prescriptions containing several ingredients the adverb **simul**

("together") may be used with *tere*, e.g., **tere simul et fac pastam**, "rub together and make a paste." *Tere* is the imperative form *tero* ("I rub, stir, mix by rubbing"); its construction is similar to that of *misce*.

7. **Tritura**, meaning triturate, is used when the mixture is more specifically in the nature of a trituration; as, **tritura et fac tabellas**, "triturate and make tablets." It is also used where dry solids are to be powdered. It is the imperative from *trituro* ("reduce to a powder").

8. **Fac talem** or **-e, tales** or **-ia** means "make such." This construction is used in prescriptions in which the quantities stated for the several ingredients are the amounts required for a *single dose* of the specified size. It is followed by the name of the dose, as pill, powder, etc., or merely by the word for dose (*dosis*), the accusative case being used. If the total prescription calls for only one dose, one might write **fac talem dosem**; this is, however, unusual, as a number of doses is generally specified, thus: **Fac tales doses xx**, "make twenty such doses."

9. **Dentur tales doses No. —**, translated, "let such doses be given to the number of —," is sometimes used instead of the preceding expression. It should be followed by a clause designating the form of the dose to be dispensed, e.g.: **Dentur tales doses No x et fiant pilulæ**, or **et pone in capsulas**, etc. **Dentur** is the third person plural in the passive subjunctive, and the word **doses** is therefore in the nominative as the subject of the verb. The abbreviation "D. t. d."

is frequently used instead of writing out the full form, but its use is not to be encouraged.

**10. Consperge**, meaning sprinkle or dust; or **obduce**, cover or coat, may be used to direct the pharmacist to coat troches, pills, etc., with a powder, gelatin, or other substance. Either the imperative form (given above) or the passive subjunctive form may be used. The name of the substance to be employed as the coating is to be expressed in the ablative case, *e.g.*: **Consperge trochiscos saccharo lacte**, "Dust the troches with milk sugar." **Pilulæ gelatino obducantur**, "let the pills be coated with gelatin." Where the name of the preparation to be coated has just been used it need not be repeated, *e.g.*: **Fiant pilulæ et gelatino obducantur**, "let pills be made and let (them) be coated with gelatin."

**11. Numero** in prescriptions is written in the ablative (nominative, *numerus*), the construction being termed the *ablative of specification*. It is to be translated literally—"to the number of," and is usually abbreviated to **No.**

## CHAPTER IV

### WEIGHTS AND MEASURES

Two distinct systems of weights and measures are in use at present—the apothecaries' and the metric systems. The former is the older, and is still in fairly general use among physicians and pharmacists. This is due to the fact that the older physicians were not made thoroughly conversant with the metric system, and to the continued use in text-books of the apothecaries' system in the expression of doses. Its use has been propagated further by the fact that the Government has merely legalized the metric system and has not made its use compulsory. In spite of these factors acting to foster the continuance of the apothecaries' and to retard the adoption of the metric system, the latter is growing in popularity and will eventually supplant the former. Among the more important advantages possessed by the metric system may be mentioned the following: (1) It is the legal system of the majority of civilized nations; (2) it is the system used in science the world over; (3) it is the same in all countries; (4) the terms of weight and measure are based upon a common unit, the meter; (5) its nomenclature is self-explanatory; (6) it is a decimal system.

In addition to the advantages just mentioned, the physician of the present must be familiar with the metric system, because it is supplanting the apothecaries' system; because it has been adopted for the Pharmacopœia and the National Formulary, and the doses are there given in metric units: because the doses of many of the newer remedies are expressed in its terms; because it is the only system in use in Continental medical literature; and because it is in general use in British and American scientific medical writing. Further, its use in prescription writing is very simple, as here it is customary to express all weights and measures in the terms of a single unit and its decimal fractions, the gram or cubic centimeter being that unit. Strictly, the gram and cubic centimeter are identical in the case of distilled water only, and at a certain temperature.

For its most successful utilization one should become thoroughly familiar, by sight and touch, with the actual size and weight of such common weights as a milligram, gram, and kilogram, and such fluid measures as the cubic centimeter and the liter. (For fluids, no smaller unit of measure than the cubic centimeter is in common use.)

Medical students of to-day are, of course, well conversant with the metric system and older physicians who wish to modernize their prescriptions may gain a considerable degree of familiarity with the metric system by means of a thorough acquaintance with certain of the relations which exist between it and the apothecaries' system, and by facility in the application

of certain rules for interconversion between the two systems. These relations will be shown in the form of a table, and the rules will be given in the following pages.

For a more detailed discussion of the two systems the reader is referred to the appropriate works on the subject. The following is intended to cover the needs of prescription writing only.

### THE METRIC SYSTEM

This is now the **official** system of weight and measure. It takes its name from its unit, the **meter**, which is the ten-millionth part of the quadrant of the earth's circumference measured from the pole to the equator. The meter is the basic unit from which all terms of weight and measure are derived.

In prescription writing the **gram** and the **cubic centimeter** respectively are commonly employed as the units of weight and measure, either as such, or in the form of their multiples or decimal fractions.

The **gram** is the unit of weight, and is the weight of one cubic centimeter of distilled water at its maximum density, that is, at the temperature of  $4^{\circ}\text{C}$ .

The **cubic centimeter** is the capacity of a cube each side of which measures one centimeter. One cubic centimeter of any fluid having approximately the same specific gravity as water is considered, for convenience, as weighing one gram.

In the metric system certain prefixes are used in conjunction with the units to indicate multiples or decimal fractions thereof.

### PREFIXES FOR MULTIPLICATION OF THE UNITS

deca-	= ten	multiplies the unit to which prefixed by ten
hecto-	= hundred	multiplies the unit to which prefixed by one hundred
KILO-	= THOUSAND	multiplies the unit to which prefixed by ONE THOUSAND

### PREFIXES FOR DIVISION OF THE UNITS

deci-	= ten	divides the unit to which prefixed by ten
CENTI-	= HUNDRED	divides the unit to which prefixed by ONE HUNDRED
MILLI-	= THOUSAND	divides the unit to which prefixed by ONE THOUSAND

The prefixes used for multiplication are derived from the Greek, while those for division are Latin. Thus a milligram would be  $\frac{1}{1000}$  gram, usually written in the decimal fraction—0.001 Gm.; a kilogram would be 1000 grams. Certain of these prefixes are not commonly used in practice; thus, *deca-* and *hecto-*, which are given in small type in the table, are seldom used in medicine; *deci-* is used rather more frequently, but still is not of very common occurrence. Usage will be discussed further after the tables of weights and measures have been given.

Only such tables will be given as are of use in prescription writing; a more detailed discussion must be sought elsewhere. The orthography used is that recommended by the Boston

Metric Bureau, and is that in general use in the United States.

#### TABLE OF METRIC WEIGHTS

GRAM	= weight of one cubic centimeter of water at 4°C.	Gm.	= 1.0
decigram	= one-tenth of a gram	dcgm.	= 0.1
CENTIGRAM	= one-hundredth of a gram	cgm.	= 0.01
MILLIGRAM	= one-thousandth of a gram	mgm.	= 0.001

In common practice the decigram is seldom used, the centigram more frequently, and the gram and milligram are the usual forms. Thus, it is customary to speak of 0.125 Gm. as 125 milligrams, rather than one and one-quarter decigrams, or twelve and one-half centigrams; 0.05 Gm. might be spoken of as either 50 milligrams or as 5 centigrams, but almost never as half a decigram.

#### TABLE OF METRIC FLUID MEASURES

MILLILITER, CUBIC CENTIMETER, c.c.	=	1.0
Deciliter	dl.	= 100.0 c.c.
LITER	L.	= 1000.0 c.c.

The cubic centimeter and the liter are the two of the foregoing terms which are in common use, and of these the cubic centimeter is the measure which is used in prescription writing.

In European countries it is the custom to weigh both solids and fluids, and such a procedure introduces a complication in the use of the metric system, owing to the differences in specific gravity of some of the very light or very heavy fluids. The complication arises in estimating the bulk of a prescription containing one of these fluids, for the dose which the patient takes is



ordinarily measured there as well as here, and differences in the total bulk of the prescription from the average reduce the number of doses, or increase them, in some cases so greatly as to affect materially the amount of the contained ingredients in each dose of the resulting prescription. Thus, if a prescription called for 20 doses of a teaspoonful each (5 c.c.), the total bulk would have to be 100 c.c.; if glycerin was a considerable constituent, one would have to take into consideration the fact that one cubic centimeter of it weighs considerably more than one gram, hence the number of grams which would have to be added to the prescription to give the proper bulk would be much more than of a corresponding bulk of a fluid of the same weight as water. It is not necessary, however, to discuss these factors of specific gravity further in this place, for in English-speaking countries the custom of measuring fluids, instead of weighing them, has been preserved in the metric system. The use of fluid measures also extends to the expression of doses in the U.S.P. and N.F. On the whole, this is the preferable method as far as prescriptions are concerned, for, as mentioned above, the patient will measure his dose of a fluid medicine and not weigh it.

It is well to remember however, that the gram and cubic centimeter are practically interchangeable except in the case of the preparations, such as ether, which are much lighter than water, or glycerin, etc., which are much heavier than water.

In the United States, then, a metric prescription calling for both solid and fluid ingredients may be written thus:

R. Sodii Bromidi..... 2.5  
 Chlorali Hydrati..... 1.0  
 Aquae.....q.s. ad 100.0  
 Misce.  
 Sig.—One teaspoonful every four hours.

It will be observed that no mention of the units of weight or measure is made in the prescription. They are omitted because it is generally understood that the solids will be weighed and the fluids will be measured. As the gram and cubic centimeter are the only units in use in prescription writing, it is understood that these are the units to which the numerals in the prescription refer. However, for additional clarity many write *Gm. vel c.c.* above the column of numerals. In the arrangement of the column of numerals one should be careful to *place the decimal points one above the other*, in order to avoid error in the reading of the quantities. If one is going to make use of the metric system in the majority, or all, of his prescriptions, it is well to have prescription blanks printed with a vertical line to replace the decimal points, thus:

*Gm. vel c.c.*

R. Potassii Citratis..... 4|0  
 Infusi Buchu.....q.s. ad 100|0

Under such circumstances the cipher before or after the decimal line is often omitted, but where the decimal point is employed the cipher should always be used to avoid error in reading the location of the point.

The calculation of the amount of a drug which is to be added to a prescription to make each dose contain the desired quantity is very easy in the metric system, consisting of simple multiplication with the expression of the result in whole numbers and decimal fractions of a common unit. There being only one unit in common use in prescription writing for weight and one for measure, and these being practically interchangeable, no reduction to a larger or smaller suitable unit is necessary, as is the case in the apothecaries' system.

As some of the practising physicians of the present day, some teachers, and a few textbooks still retain the apothecaries' system for the expression of doses, some are not yet as thoroughly familiar with the doses of drugs in the metric system as they should be. Those who are students now will need to become familiar with the expression of doses in the older system to understand easily the writings and teaching of their predecessors. This being the case, it becomes important to have an idea of the relations existing between the two systems. These relations are given in two tables, showing the nearly exact and the approximate equivalents.

TABLE OF EQUIVALENTS, WEIGHT

<i>Apothecaries'</i>		<i>Metric, Nearly Exact</i>	<i>Metric, Approximate</i>
One grain	=	0.065 Gm.	0.06 Gm.
One dram	=	3.88 Gm.	4.00 Gm.
One ounce	=	31.10 Gm.	30.00 Gm.

## TABLE OF EQUIVALENTS, FLUID MEASURE

<i>Apothecaries'</i>		<i>Metric, Nearly Exact</i>	<i>Metric, Approximate</i>
One minim	=	0.062 c.c.	0.06 c.c.
One fluidram	=	3.69 c.c.	4.00 c.c.
One fluidounce	=	29.57 c.c.	30.00 c.c.
One pint	=	473.12 c.c.	500.00 c.c.

To facilitate the grasping of the relations they may also be presented as follows:

TABLE

<i>Metric</i>		<i>Nearly Exact</i>	<i>Apothecaries' Approximate</i>
0.001 Gm.	=	gr. $\frac{1}{65}$	gr. $\frac{1}{60}$
1.0 Gm.	=	gr. 15.43	gr. 15
1.0 c.c. (mil)	=	℥ 16.23	℥ 15

It is not necessary to use the exact equivalents, except in those instances in which a very toxic drug is being prescribed and where the number of doses in the prescription is such that the multiplication of a small error would materially affect the amount actually given. In ordinary practice the approximate equivalents are close enough, for an error of 10 per cent. in dose is generally permissible in therapeutics.

To simplify the conversion from the terms of one system into those of the other, three rules have been formulated and are given in the Fourth Annual Report of the Surgeon General of the United States, 1887. In a somewhat modified form they are:

TO CONVERT FROM THE APOTHECARIES'  
SYSTEM INTO THE METRIC

When the quantity is expressed in terms of the apothecaries' system.

1. *Reduce the quantity to grains or minims and divide by 15: the result will be the equivalent number of grams or c.c.*

2. *Reduce the quantity to drams and multiply by 4: the result will be the equivalent number of grams or c.c.*

3. *Reduce the quantity to ounces and multiply by 31: the result will be the equivalent number of grams or c.c.*

Though these rules apply only to conversion from the apothecaries' system to the metric, it is obvious that, by simple reversal of the process in each case, they are equally applicable to conversion from the metric into the apothecaries' system. Thus, to convert grams to drams one need only to divide the number of grams by 4. It must be borne in mind that as there are three common units in the apothecaries' system, conversion from the metric may yield fractions of the unit desired, and the result must, therefore, be reduced to terms of the most appropriate unit after conversion.

#### THE APOTHECARIES' SYSTEM

This is based upon the Troy system of weights and the wine measure.

#### TABLE OF APOTHECARIES' WEIGHTS

			<i>Symbol</i>
		GRAIN	gr.
60 grains	=	1 DRAM	$\frac{1}{3}$
8 drams	=	1 OUNCE	$\frac{1}{3}$
12 ounces	=	1 pound	lb. (libra)

The grain, dram, and ounce are the most common units in prescription writing. The scruple

is no longer used, partly, at least, owing to the likelihood of its symbol being confused with that for the dram when hastily written. The grain is the smallest unit, and its subdivisions are expressed as common fractions. The dram contains 60 grains, and is one-eighth of an ounce. The ounce contains 8 drams, or 480 grains. The pound is never used in the prescription, but it should be known for comparison with the kilo of the metric system.

The unit, or its symbol, or abbreviation is commonly written first in the apothecaries' system, and is *followed by the numeral*, which is to be expressed in the *Roman characters*, thus: twenty grains = gr. xx, etc. In the case of the use of fractions of a grain the abbreviation of the unit again precedes, but here the numeral is to be expressed in the Arabic notation in the form of a simple fraction thus one-sixtieth of a grain would be written gr.  $\frac{1}{60}$ , etc. An exception to the use of the common fraction occurs in the case of the *half*, which is commonly expressed by the abbreviation ss., which stands for (*cum*) *semisse*, meaning "and a half;" thus half a grain would be written gr. ss.; two and a half grains, gr. iiss, etc.

#### TABLE OF APOTHECARIES' FLUID MEASURES

			<i>Symbol</i>
		MINIM	℥
60 MINIMS	=	1 DRAM	℥
8 DRAMS	=	1 OUNCE	℥
16 OUNCES	=	1 pint	O (octarius)

It will be seen at once that this table is closely similar to the one of weights—the grain and

minim correspond, the dram and fluidram, and the ounce and fluidounce, agree one with the other. The pint (water), weighs approximately one pound Avoirdupois, but as there are 16 ounces in the pint, the fluid ounce, fluid dram, and minim weigh less than the corresponding units of weight. Since we do not weigh fluids in the apothecaries' system, it is unnecessary to consider these differences more in detail. For the purposes of calculation in the average prescription it is necessary to use but a single group of figures which are common to both solids and fluids; that is, for both weight and measure, as there are as many minims in the fluidram and fluidounce respectively as there are grains in the dram or ounce, and as the number of fluidrams in the fluidounce is the same as that of drams in the weighed ounce.

In the case of the fluid measure the dram and ounce are often distinguished from their corresponding terms of weight by the prefixing of the letter *f* to the symbol. This is hardly necessary, for it is understood that when a fluid is indicated it is to be measured, while a solid is to be weighed.

The system of notation is similar to that discussed under the subject of weights, except that one seldom calls for the measuring of fractions of a minim other than a half.

In the use of the Roman numerals it is customary to draw a line above the cardinals and to place a dot over each "i," to prevent error, for two "i's," if hastily written, may be almost run

together at the bottom and are likely to be read as a "v," etc. If they are dotted, such an error becomes practically impossible. When final the "i" is usually written "j," as viij.

### HOUSEHOLD MEASURES

While the physician and the pharmacist can deal in terms of uniform and standard weights and measures, the patient generally resorts to the use of one of the household utensils as the means of measuring the doses he must take. These household measures are not of uniform size. It would be far better, therefore, if the physician would advise his patients to provide themselves with the inexpensive and fairly accurate graduated medicine glasses and droppers which are to be found in any pharmacy. No mention is made here of the measuring of solid prescriptions, for these are usually ordered dispensed already subdivided into some convenient form of dose, such as the pill, capsule, powder, etc.

While the use of the graduated dropper and medicine glass is gaining in popularity, the use of the household measure is still the custom; hence a brief table showing the equivalents of these measures is desirable. As these measures are not uniform in size, it is not possible to give more than the approximate equivalents of each.

TABLE OF HOUSEHOLD MEASURES WITH  
APPROXIMATE EQUIVALENTS

<i>Household Measure</i>		<i>Metric</i>	<i>Apothecaries'</i>
Teaspoon	=	5.0 c.c.	One dram
Dessertspoon	=	8.0 c.c.	Two drams
Tablespoon	=	15.0 c.c.	Half- ounce
Wineglass	=	60.0 c.c.	Two ounces
Glass	=	250.0 c.c.	Eight ounces



## CHAPTER V

### THE PRACTICAL WRITING OF PRESCRIPTIONS

THE so-called typical prescription has four distinct portions in the inscription. These are known as the **basis**, the **adjuvant**, the **corrective**, and the **vehicle**, or **excipient**. The following example will illustrate these:

#### A. LATIN FORM WITH APOTHECARIES' SYSTEM

1.... R. Aloini.....gr. ss  
2.... Extracti Nucis Vomica.....gr.  $\frac{1}{8}$   
3.... Extracti Belladonnæ.....gr.  $\frac{1}{6}$   
4.... Extracti Gentianæ.....q. s. ad gr. ij

Misce et fac tales pilulas numero xx.

Sig.—Take one or two (1 or 2) at bedtime, as required.

MR. SMITH.

J. MEDICUS, M.D.,  
January 1, 1913.

#### B. ENGLISH FORM WITH METRIC SYSTEM

1.... R. Aloin.....o|o30  
2.... Extract of Nux Vomica.....o|oo8  
3.... Extract of Belladonna.....o|o10  
4.... Extract of Gentian.....to make o|125

Mix and make 20 such pills.

Label: Take one or two (1 or 2) at bedtime, as required.

MR. SMITH.

J. MEDICUS, M.D.,  
JANUARY 1, 1913.

1. Aloin is the **basis**—that is, it is the drug from which the prescription is to derive its chief action.

2. Extract of *nux vomica* is the **adjuvant**. It is given to aid and increase the action of the basis, aloin.

3. Extract of *belladonna* is the **corrective**. It is used to correct and overcome the undesired actions of the basis, or of the basis and adjuvant combined.

4. Extract of *gentian* is the **excipient**, and it has no action of note in the prescription. It is ordered merely to provide the necessary bulk and to facilitate the combination of the active ingredients into a pill of suitable size and consistence.

At the present time the majority of prescriptions differ more or less widely from this typical form. Nevertheless, the type serves to indicate the proper order for the constituents in those prescriptions in which two or more ingredients are used. Thus, the chief ingredient is always to be placed first; if there is more than one active ingredient, these should precede the remaining minor ones. The vehicle or excipient, together with any additional solvents or diluents should close the inscription. Other constituents, if present, should fill in between these two groups.

The foregoing illustration shows that the form and construction of the prescription are essentially identical for both Latin and English as well as for both metric and Apothecaries' systems. It is a matter of individual preference which shall be used, though both should be learned.

## THE CONSTRUCTION OF A PRESCRIPTION

The construction of any prescription should proceed in the following manner:

1. After the sign *R*. write the official English or Latin, names of the several ingredients desired, being careful to use the proper cases when using the Latin, and following the general order just described.

2. Write the subscription, as this often contains one of the factors determining the bulk of the entire prescription.

3. Write the directions to the patient, as these give the size of the single dose which is to be taken, and the number of such doses for a day or other given period of time.

4. Complete with the name of the patient, the prescriber's signature, and the date.

5. Calculate the amount of each of the several constituents which must be used in the total prescription to make each single dose contain the amount which it is desired to have the patient receive at each administration. Write this quantity after each of the ingredients.

It is advisable, when the prescription has been completed, to read it and to verify the calculations throughout.

The **amount** of each ingredient which is to be contained **in a single dose** must be determined by the physician, according to the conditions to be met and the end desired.

The **size of the single dose** of the completed prescription is to be determined by a consideration of the combined bulk of the several ingre-

dients in one dose; by the degree of solubility of the ingredients in the vehicle, if the prescription is fluid; by the bulk of the single dose in the case of solid prescriptions; and by any other factors which may affect the suitability for administration.

The **total bulk** or **volume** of the prescription will depend upon a combination of the size of the single dose and the number of such doses which the prescriber desires to have dispensed at one time. Factors of deterioration, duration of the course of treatment, expense, liability to alteration in the plan of treatment, and the like enter to influence the total bulk of any prescription, and are, in great part, matters of experience and circumstance. The sizes of the standard bottles in common use should also be considered in the case of liquid preparations, for it is desirable to have the prescription approximately fill the bottle in which it is to be dispensed. The usual sizes of bottles for metric prescriptions are: 10, 25, 50, 100, 250, 500, c.c.; for prescriptions in the apothecaries' system they are: half ounce, one, two, four, eight, twelve and sixteen ounces.

In general, it is best to make prescriptions small rather than large, for when they are small, it is possible to repeat them if need be, while if they are too large, the patient often may be put to unnecessary expense.

To determine the total quantity of a prescription which is to be ordered one should *multiply the amount which is to be taken in twenty-four hours by the number of days over which the administration is to be continued.* Then express

the result in terms of the appropriate unit of measure. It is customary to adjust the resulting quantity so as to fill a bottle of the nearest standard size in the case of fluid preparations. Thus, if 5 c.c. of a prescription are to be taken three times a day the daily consumption will be 15 c.c. To provide enough for one week the prescription would call for 100 c.c., ( $15 \times 7 = 105$ ). If four doses were to be taken daily this quantity would last for five days.

The total bulk or volume of the prescription is usually indicated following the final ingredient, which is generally an excipient or vehicle. The final ingredient is therefore customarily directed to be added in sufficient quantity to bring the total prescription up to the desired amount. This is illustrated in the prescription for an emulsion on p. 81, in which the word, *Aquæ* is followed by the abbreviation, **q.s.**, and the preposition, **ad**. These are then followed by the symbol and figures indicating the total size of the prescription. The last line is translated: "*Of water a sufficient quantity up to (or, to make) eight ounces.*" The abbreviation, **q.s.**, may be omitted and the preposition, **ad**, used alone with the name of the drug or preparation expressed in the accusative as explained on p. 49.

#### CALCULATION OF THE AMOUNT OF EACH INGREDIENT

The prescription is to be written as directed under the head of construction. The amount of each of the ingredients which is to be contained

in each single dose must be determined by the physician according to the needs of the case. The calculation of how much of each ingredient it will be necessary to order for the total prescription, so that each single dose shall contain the desired amount is merely a matter of simple multiplication when using the metric system. To illustrate: A 100 c.c. prescription which is to be taken in doses of 5 c.c. each contains 20 doses. The single dose of each ingredient must, therefore, be multiplied by twenty. If one ingredient has a single dose of 10 milligrams the total prescription must contain 200 milligrams, which is written 0.2 Gm., as it is customary always to express the total quantities in the form of decimal fractions of a gram or cubic centimeter. A second ingredient, with a single dose of 0.6 gram would require a total amount of 12.0 Gm. ( $0.6 \times 20$ ) for the completed prescription. These calculations in the metric system are of the utmost simplicity provided that one pays due attention to the proper placement of the decimal point, a matter which ought not to be difficult in view of our daily use of a decimal monetary system. The custom of thinking of the doses of active drugs in terms of milligrams as the unit often facilitates calculation for those who are easily confused by the use of small decimal fractions.

#### THE "STANDARD" PRESCRIPTION

Many who originally learned the doses of drugs in terms of the apothecaries' system are desirous

of employing the metric system in the writing of their prescriptions. For the sake of added facility in the conversion from the apothecaries' into the metric system the use of the so-called standard prescription has been advocated. This prescription is one which contains 15 doses. The method of conversion from the apothecaries' system to the metric would be to multiply the number of grains or minims required in the single dose by the total number of doses in the prescription, and then to reduce this number of grains or minims to grams or cubic centimeters by division by 15, the number of grains in one gram, or minims in one cubic centimeter. As the "standard" prescription contains 15 doses, the multiplication of the single dose by the number of doses in the prescription exactly neutralizes the subsequent division by 15 to convert to the metric system. It is, therefore, unnecessary to go through the several steps of multiplication, for one has merely to express, in terms of grams or cubic centimeters in the finished prescription, the number of grains or minims desired for each single dose of the size specified. The use of the standard prescription might be stated in the form of a rule as follows: Knowing the dose in terms of grains or minims, and desiring to prescribe in terms of the metric system, *make the prescription contain 15 doses and, for the finished prescription, use the same number of grams or cubic centimeters as it is desired to have of grains or minims in each dose.*

Example: It is desired to give 10 grains of sodium salicylate in each teaspoonful dose; therefore the following might be written:

R. Sodii Salicylatis . . . . . 10.0  
 Aquæ Menthæ Viridis . . . . . q. s., ad 60.0  
 M. et Sig.—One (1) teaspoonful after each meal.

This example would provide a prescription which would last for only five days; if it were desired to have it last for more than a week, it would be simple to double the entire prescription. The use of the “standard prescription” is applicable only to such prescriptions as contain 15 doses or some multiple of this number.

The application of the “standard prescription” is simple, but it is a short cut and is not very accurate, and the resulting prescriptions are not typical metric ones, but are in the nature of compromises, their total volumes being based primarily upon the apothecaries’ system. It should not be used by the medical student of to-day who is familiar with the metric system.

Those who have learned the doses of drugs in the apothecaries’ system may, by a slight effort, become equally familiar with them in terms of the metric system if they will but group the drugs into classes, scaled according to the metric dose. The practice of learning the metric dose of each drug when it is used in the writing of a prescription will help the practitioner to become familiar with doses in this system. It is true that it will take some effort and consume some time, but it will more than repay the expenditure of both in the end.



METHODS OF CALCULATION FOR USE WHEN  
WRITING IN THE APOTHECARIES' SYSTEM

The principle for calculating the total amount of each ingredient which must be ordered for the completed prescription is the same in the Apothecaries' system as in the metric, viz.: *Multiply the single dose by the number of doses in the completed prescription.* Thus: A prescription contains 30 doses, and it is desired to have each dose contain 10 grains of a drug; the entire prescription must then contain 300 grains. But in the Apothecaries' system several different units of weight or measure are used and it is customary to express the total amount of each ingredient in terms of the largest convenient unit. This necessitates more complicated calculation than in the metric system, or resort to the use of short-cut methods devised to yield results which are approximately accurate. In the example just given one would reduce the 300 grains to terms of drams by dividing by 60, the number of grains in one dram. When the quantity cannot be reduced to a whole number of drams or ounces, as the case may be, there are three possible ways of meeting the difficulty:

(a) Either omit the fraction, if small, or, if it is large, add enough to raise the quantity to the next higher whole number of units. Thus: 4 drams and 10 grains would be reduced to 4 drams; 4 drams and 40 grains would be reduced to  $4\frac{1}{2}$  drams, or raised to 5 drams. This method is to be employed in those cases in which the drug is neither very active nor very

poisonous, or where the dose prescribed is such that minor additions or subtractions would not be dangerous.

(b) The quantity may be expressed in terms of the next lower unit. Thus: 2 ounces and 90 grains would become  $17\frac{1}{2}$  drams.

(c) Or, lastly, express in terms of the lowest unit of measure—grains or minims. Thus: 3 drams and 14 grains would be written 194 grains.

A fourth method is sometimes used. It is to express in the terms of two or more units. Thus: The last amount given above would simply be expressed as 3 drams and 14 grains. This method is not in general use, and is not advised, as it is clumsy.

The second method of calculation is by the use of the following—

#### FORMULA

*Divide 60 (the number of grains in one dram) by the number of doses in the prescription; then divide the desired dose by the number thus obtained; the result will represent the number of drams to be used.*

*Explanation.*—For the general purposes of prescription writing a 2-ounce mixture may be considered as containing 15 doses of a teaspoonful each; a 4-ounce mixture, 30 doses, etc.

In a 2-ounce mixture each teaspoonful dose will, therefore, contain one-fifteenth of the total amount of each of the constituents in the prescription. Taking the dram (60 grains) as the unit, if one dram of a drug is added to a two-ounce mixture, each teaspoonful dose will con-

tain one-fifteenth of a dram, or 4 grains. If, then, we merely divide the single dose, 4 grains, by this number, 4, as a unit, and express the result in the terms of drams, this will be the amount which must be added to the prescription to give the desired quantity of the drug in each single dose.

To illustrate:

*R.* Tincturæ Opii Camphoratae (dose, 15 minims)  
 Phenylis Salicylatis.....(dose, 5 grains)  
 Misturæ Cretæ...q. s. ad four ounces.  
 Misce et Sig.—One (1) teaspoonful as directed.

This prescription contains 30 doses of the specified size, one dram each.

Divide 60 (grains in one dram) by 30 (the number of doses) = 2.

Divide 15 (the desired dose of camphorated tincture of opium) by this unit, 2, =  $7\frac{1}{2}$ ; express in terms of drams.

Repeat this process with the dose of phenyl salicylate, the dividing unit remaining unchanged.

Finally, the simplest and quickest method may be stated as follows:

Where the dose of the prescription is one dram the amount of each ingredient to be ordered is:

1. For an eight ounce prescription (60 doses) the same number of drams as of grains or minims which it is desired to give in each dose.

2. For a four ounce prescription (30 doses), one-half as many drams as of grains or minims per dose.

3. For a two ounce prescription (15 doses), one-quarter as many drams as of grains or minims per dose.

*Explanation.* If there are 60 doses in a prescription 60 times as many grains or minims must be ordered for the whole prescription as it is desired to give in each dose. But to reduce the resulting total number of grains or minims to drams it is necessary to divide by 60 (the number of grains or minims in one dram). The multiplication and division cancel each other, hence one merely changes the sign from grains or minims per dose to drams for the whole prescription, etc.

#### THE USE OF Q.S. TO EXPRESS INDEFINITE QUANTITIES

When an excipient, solvent, flavor, or other therapeutically unimportant constituent is designated in a prescription it is generally unnecessary to specify the exact amount to be used. This should preferably be left for the pharmacist to determine according to pharmaceutical needs. In lieu, therefore, of stating a definite quantity it is better to follow the name of such an ingredient with the abbreviation **q.s.**, meaning, *a sufficient quantity*. When this is done it is well to indicate the fact that the apothecary is expected to be guided by pharmaceutical needs by inserting the phrase **secundum artem**, meaning *appropriately*, or *according to the art or custom*, in the subscription. These are illustrated by the following example:

℞. Olei Morrhuae..... ℥iij (96.0 c.c.)  
 Olei Menthæ Piperitæ... q.s.  
 Syrupi..... q.s.  
 Acaciæ..... q.s.  
 Aquæ..... q. s. ad ℥viij (250.0 c.c.)  
 Misce et fac emulsum secundum artem.  
 Sig.

## PERCENTAGE IN PRESCRIPTIONS

In the prescription of lotions, liniments, solutions, ointments, and other preparations, especially those for external use, it is often most convenient to think of their activity in terms of the percentage strength of their constituents. Prescriptions of this type may be written in either of two forms.

**I. The Percentage Form.**—This is the simpler of the two, but it is applicable only to aqueous solutions of single drugs or to simple solutions or ointments in which the choice of the solvent or base is immaterial and may be left to the apothecary. If the drug is soluble in water and no solvent is specified it is understood that the pharmacist will use water. The following examples illustrate this form:

℞. Solutionis Phenolis, 5 per cent... ℥iv  
 Sig.—Apply to dressing as directed.  
 ℞. Spirit of Menthol, 10 per cent... 50.0 c.c.  
 Label.—Apply with friction to painful area.  
 ℞. Unguenti Sulphuris, 10 per cent. 100.0 gm.  
 Sig.—External use only, as directed.

In the first of these examples the pharmacist will dispense four ounces of an aqueous solution of carbolic acid containing one part of acid in twenty of the finished solution. In the second,

menthol being insoluble in water, but soluble in alcohol, the word *spirit* is used to replace *solutio*, and the pharmacist will dispense 50 c.c. of an alcoholic solution. In the third example it is immaterial what fatty base is employed, and the pharmacist is left to select that which is best suited to the preparation of the ointment.

2. **The Regular Form.**—This is the usual form of the prescription and may be employed in the writing of all prescriptions of percentage composition including those just indicated. In this form the prescription is written out completely, specifying the solvent or base, and the amount of each of its ingredients is calculated and expressed in the usual terms of weight or measure. The term *per cent.* is an abbreviation of per centum, meaning per hundred, or *in a hundred*, and is an expression of a ratio the second factor of which remains constant—one hundred. The calculation of the amounts of the drugs to be taken for these prescriptions is extremely simple, being made by many by simple “inspection.” Experience shows, however, that some persons have difficulty in calculating percentage. The succeeding two paragraphs explain the procedure.

*Calculation for the Metric System.*—Determine the total weight or volume of the prescription which is to be dispensed. Multiply this by the number representing the percentage strength desired for the first ingredient. Divide the resulting quotient by 100, which is accomplished by moving the decimal point two places to the

left. Express the result as grams or cubic centimeters. Repeat for each additional ingredient.

Example: It is desired to prescribe 50 c.c. of a solution which is to contain 25 per cent. of oil of eucalyptus, and 1 per cent. each of menthol and of creosote, in the compound tincture of benzoin. Multiply 50 the number of c.c. in the total, by 25, the per cent. of oil of eucalyptus desired— $50 \times 25 = 1250$ . Divide this quotient by 100 and the result is 12.5 or the number of c.c. of oil of eucalyptus to be used. Apply the same procedure to each of the other constituents and express the results in terms of grams or cubic centimeters. It is often simpler to calculate by short methods; thus in the case of eucalyptus 25 per cent. is one-quarter of 100, hence it is merely necessary to take one-quarter of the 50 c.c. desired. Writing out the prescription thus we have:

R <sub>x</sub> .	Olei Eucalypti.....	12.5
	Mentholis.....	0.5
	Cresoti.....	0.5
	Tincturæ Benzoini	
	Compositæ.....	q.s. ad 50.0
	Misce et sig. Twenty drops in boiling water as an inhalation.	

*Calculation for the Apothecaries' System.*—The basis for calculation in this system is the grain or minim and, although the system is not a decimal one, it is possible to render the calculation quite simple. It is first necessary to determine the number of grains or minims in the total prescription and for this purpose it is customary to consider one ounce as containing

500 grains or minims for ease of calculation. The first step therefore is to multiply 500 by the number of ounces in the whole prescription. In the previous example the prescription would be written for two ounces therefore  $500 \times 2 = 1000$  minims in the total. Multiply the total number of minims by the number representing the per cent. desired; in the case of the oil of eucalyptus this is 25, hence  $1000 \times 25 = 25,000$ . Divide this quotient by 100— $25,000 \div 100 = 250$  minims. Reduce this to the simplest unit of weight or measure, in this case half an ounce.

A much simpler method of procedure is to use 5 grains or minims as being one per cent. of one ounce. This is then multiplied by the number of ounces in the prescription— $5 \times 2 = 10$  (minims)—and this, in turn, by the number of times one per cent., which is desired— $10 \times 25 = 250$  (minims). Reducing this to the appropriate unit it is expressed as half an ounce. Other short cuts for calculation can readily be worked out to suit best the mathematical aptitudes of the individual.

The prescription is then written out thus:

R̄.	Olei Eucalypti.....	℥ss
	Mentholi.....	gr. x
	Creosoti.....	℥x
	Tincturæ Benzoini Compositæ. q.s. ad	℥ij
	Misce et sig., etc.	

### THE USES OF ANA OR $\overline{AA}$

The preposition, *ana*, or usually its abbreviation,  $\overline{aa}$ , means *of each*, and may be employed in the inscription in any of the following ways:



1. *When equal quantities of two or more ingredients are prescribed.*

℞. Ammonii Bromidi.....  
 Potassii Bromidi.....  
 Sodii Bromidi..... āā 5.0 gm.  
 Aquæ..... q.s. ad 50.0 c.c.

Misce et. sig. One teaspoonful in half a glass of water at bedtime.

In this prescription the pharmacist is required to take of *each* of the bromids the 5 grams which is specified after the āā. This avoids the repetition of the same figure in writing the prescription. This usage is permissible only when the several drugs governed by āā are of the same kind, that is, when they are all solid or all liquid.

It is improper to use it if one drug is solid and the other liquid, as one must be weighed and the other measured.

2. *When two or more similar drugs or preparations are to be prescribed in equal quantities.*

℞. Tincturæ Digitalis..... } āā ʒj  
 Elixiris Aromatici..... }  
 Misce et sig. One teaspoonful morning and evening.

In this example a two ounce mixture is to be made by using one ounce of *each* of the specified ingredients.

This type of prescription is sometimes *erroneously* written:

℞. Tincturæ Digitalis..... } āā q.s. ad ʒij  
 Elixiris Aromatici..... }  
 Misce et sig.

This usage is incorrect because the proportion of the two (or more) ingredients may be anything at all as long as the total measures two

ounces. A prescription so written would, however, usually be compounded by mixing equal amounts of the ingredients, the pharmacist so interpreting the physician's intention. The ambiguity may be avoided by the omission of *q.s.* and its replacement by *partes æquales*, meaning equal parts.

R. Tincturæ Digitalis. . } partes æquales, ad ʒij  
 Elixiris Aromatici. . }  
 Misce et sig.

3. *When indefinite quantities of therapeutically inert agents*, such as excipients, vehicles, flavors, etc., *are to be used*, as in the prescriptions of suspensions, emulsions and the like. Here the precise amounts are best determined by the pharmaceutical requirements of the particular prescription and the decision should be left to the one who is to compound the prescription. As neither weight nor measure is specified, solids and liquids may be grouped together.

Example:

R. Olei Olivæ..... 100.0  
 Olei Cinnamomi..... }  
 Acaciæ..... } āā q.s.  
 Syrupi Tolu..... }  
 Aquæ..... q.s. ad 250.0  
 Misce et fac emulsum secundum artem.  
 Sig.—One tablespoonful after each meal.

#### CLASSIFICATION OF PRESCRIPTIONS

Prescriptions have been divided into several classes, but the distinctions are not sufficiently sharp to permit of accurate grouping. A prescription may contain but a single drug, or it may be composed of two or more drugs having

similar or dissimilar actions. Further, it may be complex, consisting of two more or less distinct portions. Prescriptions which are written to be compounded according to the formula of the physician are spoken of as *magistral* or *extemporaneous*, while those which call for preparations the formulas for which are given in the Pharmacopœia or National Formulary are designated as *official* prescriptions. Almost all prescriptions are of the former, or extemporaneous, class.

A prescription which contains a large number of drugs is often spoken of as a "shot gun" prescription, because it is given with the hope that one or more of its ingredients will "hit the mark." Fortunately this form of prescription is practically obsolete at present, for it is utterly unscientific and frequently dangerous.

The simplest of prescriptions might be represented by the following:

R. Sulphonethylmethani.....0.75

Fac chartulam i.

Sig.—Take dry on the tongue, wash down with water.

MR. SMITH.

J. MEDICUS, M.D.,  
January 1, 1913.

The following would be regarded as compound:

R. Strychnine Phosphate..... 0.03

Soluble Ferric Phosphate..... 0.50

Aromatic Elixir...to make.....50.0

Mix and make a solution.

Label.—Take one (1) teaspoonful in water before each meal.

MR. SMITH.

J. MEDICUS, M.D.,  
January 1, 1913.

The following illustrates the more complex type of prescription:

R. Tritici..... 10.0  
 Aquæ Bullientis.....200.0  
 Fac infusum et adde—  
 Potassii Citratis..... 80.0  
 Fac solutionem.  
 Sig.—Take one (1) teaspoonful every four (4) hours.  
 MR. SMITH. J. MEDICUS, M.D.,  
 January 1, 1913.

Both the compound and complex prescriptions given above are magistral prescriptions.

An official prescription is indicated by the example given below:

R. Liquoris Ferri et Ammonii Acetatis...50.0  
 Sig.—Take one (1) teaspoonful in water after each meal.  
 MR. SMITH. J. MEDICUS, M.D.,  
 January 1, 1913.

In addition to the preceding, prescriptions may be grouped according to their physical properties, thus:

- |                          |                             |
|--------------------------|-----------------------------|
| 1. FLUID PRESCRIPTIONS:  | 2. SOLID PRESCRIPTIONS:     |
| Collodions               | Cachets                     |
| Collyria, or eye-washes  | Capsules                    |
| Decoctions               | Cerates                     |
| Draughts                 | Granular effervescent salts |
| Elixirs                  | Papers                      |
| Emulsions                | Powder (pulvis)             |
| Enemas                   | Powders (chartulæ)          |
| Gargles                  | Pills                       |
| Infusions                | Tablets                     |
| Liniments                | (a) triturate               |
| Lotions or washes        | (b) compressed              |
| Mixtures and suspensions | Troches                     |
| Mucilages                |                             |
| Solutions or liquors     |                             |
| Sprays                   |                             |
3. SEMI-SOLID PRESCRIPTIONS:
- Pastes  
 Poultices  
 Ointments  
 Plasters

## CHAPTER VI

### THE DOSES OF DRUGS

THE question as to how much of a drug should be given to a patient is so greatly a matter of circumstance, experience, and observation that rules for the settling of this problem cannot be formulated. Aside from experience, there are certain factors which are so frequently encountered and which are of such importance in guiding one in the determination of the dose of any drug that it is deemed best to present some of them, at least, in the form of a suggestive discussion. The remarks about to be made are intended purely as suggestions, and an endeavor has been made to confine them to generalities, rather than to make them specific and concrete in character.

The Pharmacopœia and the National Formulary assign to each drug and to most preparations a dose which is supposed to represent the average amount generally given as a single dose. These so-called average doses are so subject to modification to conform to the varying conditions and requirements as to be of very little value except as indications of the relative activity of the several drugs. Those drugs having doses of 10 milligrams or less, a small

fraction of a grain, are obviously quite active, and in most instances, also, quite toxic. Those with doses of 0.1 gram or more, several grains, are usually both less active and less toxic. Those having large doses, over 4 grams—a dram or more—are, for the most part, relatively inactive, and usually not toxic. In the use of the last two classes a great degree of accuracy in gaging the single dose is not generally necessary. In the case of the first class, care and accuracy cannot be too great.

With this knowledge of the approximate activity and toxicity of any drug which is to be prescribed one should adapt the dose to the circumstances of the case. Such adaptation should take into consideration the following factors:

1. The **age** of the patient. The aged and the very young are *usually* believed to be more susceptible to the actions of drugs than is the average adult.

2. The **weight**. A consideration of this factor is of great importance, and at the same time is generally neglected. One not infrequently sees doses of the same size, of even a potent and dangerous drug, given to two patients, the one weighing nearly twice as much as the other. Negligence, lack of thought, or actual ignorance on the part of the physician is the cause of such a discrepancy in the doses actually received by the two patients. Such carelessness is inexcusable, and is not in accord with the modern scientific spirit. Not only is the weight to be taken into consideration, but some account ought to be

taken of the obvious proportions of fat and muscle. Very obese persons, though heavy, react in most cases rather like those of lesser weight, but of greater proportionate musculature. On the other hand, in the case of some of the lipoid soluble drugs, the fat individual will usually require a disproportionately larger amount than the one with a scanty supply of fat. Pathologic growths and collections of fluid may also increase the weight, and may, at the same time, not call for any change from the dose which would be suitable for a person of the same build, but free from the abnormal causes of increased weight.

3. **Sex** is a factor of considerable importance; especially so in regard to certain drugs which may have direct or indirect influence upon the menstrual function of the female. The additional factor of pregnancy must also be considered, as it may alter not only the dose, but also the choice of the remedy which is to be used. In the case of the opium series, women occasionally show a peculiar response with excitement instead of depression.

4. **Idiosyncrasy**, so far as concerns man, may be defined as a constitutional peculiarity of response to the action of a drug. Idiosyncrasy may be individual (personal) or may be racial. The term is applied only to instances of abnormal response, and, through common usage, is often further restricted to instances of abnormal susceptibility. Strictly the term is equally applicable to either abnormal susceptibility or to

abnormal tolerance to the action of a drug. In the case of susceptibility, either the dose must be reduced or some other drug chosen. When there is tolerance, the dose will have to be increased.

5. **Disease** itself may be a great factor in the determination of the dose, for some disease processes are said to bring about tolerance for certain drugs or the reverse. Intense pain, for example, is reputed to increase the tolerance for morphin to an appreciable extent.

All the factors just given modify, not only the single dose of a drug, but also the amount which can be given in a day.

In addition to the determination of the amount suitable for a single dose, and that to be taken throughout a day, the frequency of repetition of the dose must be determined by a consideration of the factors of absorbability and rate of excretion or destruction. For instance, a drug which is rapidly absorbed and similarly very rapidly excreted or destroyed would exert its action for only a relatively brief time after the administration of a single dose. If the effect is to be maintained continuously, the single dose must, therefore, be repeated at frequent intervals. On the other hand, where excretion is very slow, the action of a single dose may be maintained, in all probability, for a considerable time after its absorption, and hence the repetition of the single dose need be only at comparatively long intervals. The latter remark applies to a certain extent also to the case



of a drug which is slowly and continuously absorbed.

Modern therapeutic methods have done a great deal toward simplifying the meeting of all these considerations, for now that we have much fairly definite knowledge of the actions of the several drugs, both therapeutic and toxic, and since we have greater purity of preparations and a larger number of pure principles, it is possible, by the use of but a single remedy at a time, to begin with a safe dose and more or less rapidly to increase the dose to the point of the appearance of the desired therapeutic effect, or until minor toxic symptoms develop. The dose can be scaled down from this point so as to meet the requirements of the individual case with considerable nicety. Such a procedure is the rational one, but it calls for a good knowledge of the pharmacology of the drugs which are employed, which is the basis for the intelligent use of medicinal agents.

After a consideration of the preceding remarks, one is inclined to think that extreme accuracy of dose is invariably necessary in the practice of prescription writing. Such, however, is not the case. For example, in the determination of the total amount of a drug which is to be directed for a prescription in order to give a desired amount in each dose, it is not usually necessary to carry out the calculation to small fractions in the case of the average drug. It would be as absurd to do this when prescribing a relatively non-toxic drug, and one which could be given in single

doses of half a gram (gr. viij) or more, as it would be to speak of an ordinary walk for pleasure in terms of inches in stating its length. When prescribing such drugs in the Apothecaries' system it is customary after calculating the total amount needed for the completed prescription, then to round this off, by addition or subtraction, to the nearest whole number of units. Thus one would not order 3 drams and 42 grains of such a drug, but would raise this to 4 drams, and express as such or as half an ounce. In the metric system such a "rounding-off" process does not usually bring about so great an alteration in the dose, for we speak in terms of smaller units. It is well to remember that, statements to the contrary notwithstanding, the ordinary prescription balance is not accurate to less than 0.006 gram (gr.  $\frac{1}{10}$ ). In general, a variation of not over 10 per cent. in dosage is permissible, for it must be borne in mind that therapeutics is not an exact science.

In the case of very toxic and active drugs, such, for example, as atropin sulphate, ouabain, etc., of which the single dose is 0.6 mgm. ( $\frac{1}{100}$  grain) or less, exactitude in calculation and in expression of the amount for the total prescription cannot be too great for safety. One should carry out the calculation with mathematic precision.

These last two paragraphs may be summed up in the direction to exercise common sense and be rational.

## DOSES FOR CHILDREN

To guide one in the determination of the single dose suitable for children there are several rules:

**1. Clark's Rule.**—This is based upon the relative weight of the child as compared with the weight of the average adult. The average weight of the adult is taken to be 150 pounds. The rule is to *divide the weight of the child in pounds, by the average weight of the adult,—150,—and to take this fraction of the adult dose.* Thus if the child weighs 50 pounds, this would be divided by 150, and the resulting fraction would be  $\frac{1}{3}$ . If the adult dose was 0.6 gram (gr. x), the child should receive 0.2 gram (gr. iij). This is the only rule based on scientific principles, and is the one which should be used.

**2. Young's Rule.**—This rule is based upon the age of the child, regardless of the weight. It is to *divide the age of the child by the age plus 12, and the resulting fraction is the portion of the adult dose which is to be used.* Thus:

$$\frac{\text{age} = 6}{6 + 12} = \frac{6}{18} = \frac{1}{3}$$

**3. Cowling's rule** is also based upon the age of the child. In this the fraction of the adult dose which is to be used is obtained by *dividing the age at the next birthday by 24.* Thus: age = 4; therefore  $\frac{4}{24} = \frac{1}{6}$ , which is the fraction of the adult dose to be used.

Both of these rules are based upon statistics of the weights of children at the different years of life, and the formulas thus worked out, though

inflexible, give fairly accurate results when compared with the first method.

Dilling has made a new analysis of extensive weight statistics of children and finds that Young's formula is sufficiently accurate up to the eleventh year, but that thereafter it is very inaccurate and wholly unsatisfactory. The method of Cowling, on the other hand, follows the actual percentage dose based on weight quite well until the fifteenth year, after which it falls somewhat on the small side of the actual dose required. Dilling has worked out a new formula on the basis of his analysis. It consists in dividing the age by 20, to obtain the fraction of the adult dose which is required. Dilling also gives a formula for use with the metric system. The fraction of the adult dose in this case is obtained by dividing the age, multiplied by 5, by 100, thus  $\frac{\text{age} \times 5}{100}$ .

Gabius stated a series of fractions of the adult dose which were to be used at different ages, thus: for a child of one year the fraction is  $\frac{1}{12}$ ; of two,  $\frac{1}{8}$ ; of three,  $\frac{1}{6}$ ; of four,  $\frac{1}{4}$ ; of seven,  $\frac{1}{3}$ ; of fourteen,  $\frac{1}{2}$ ; of twenty,  $\frac{2}{3}$ ; and above twenty-one years of age, the adult dose. This method is said to be about as accurate as is that of Young, but it is cumbersome, and has been almost completely supplanted by one of the first three methods given.

## CHAPTER VII

### VEHICLES

A CONSIDERATION of the subject of vehicles involves, principally, a discussion of flavoring and coloring agents for fluid prescriptions. It also includes some of the factors of solubility, along with the means of disguising the more disagreeable tastes of some drugs when in solution or suspension.

#### FLAVORING

This phase of prescription writing applies only to such preparations as are to be taken by mouth, and chiefly to such as are fluid. As the administration of drugs in the fluid state and by mouth is by far the most satisfactory for general purposes, flavoring becomes a very important subject. Flavoring is not merely a matter of imparting a suitable taste to a preparation, but also includes the efficient disguising of disagreeable tastes. Many proprietary preparations owe their popularity mainly to the fact that they are very pleasantly flavored. The subject of flavoring and disguising flavors is a matter of special importance in the case of prescriptions for women and children. But it is not alone here that it is of importance, for the work of Pawlow and other physiologists has shown that the several

functions of digestion, including absorption, are greatly influenced by the matter of taste.

There is a certain art in the selection of flavors for different purposes, but in this brief consideration the subject will be simplified as much as possible, and will be reduced to the giving of a few suggestions only. It is well to consult the tastes of the patient, as individuals differ widely in this respect and what is pleasant to one may be quite disagreeable to another. The student is advised to try the several vehicles suggested in order to become familiar with the taste of each and its capacity for disguising other and less agreeable flavors. This phase of the use of drugs, together with its associated subject, that of coloring, are the only ones which should be learned and used in a routine manner. As we take up some of the points in flavoring and coloring we will mention others, such as certain special uses of some of the vehicles and the general usefulness of others. The flavoring vehicles will be presented in three groups, according to their general properties as solvents.

### AQUEOUS VEHICLES

These are chiefly the aromatic waters and syrups, and to a lesser extent the mucilages.

The *aquæ*, or aromatic waters, are suitable as vehicles and flavoring agents for the water-soluble salts and for preparations which are not intensely disagreeable in taste. The more commonly used of these are:

Anise water,

Cinnamon water,

Fennel water, all of which are especially pleasing to children.

Peppermint and

Spearmint waters are particularly useful as vehicles for the milder alkaline salts.

The **syrups** are in very common use where aqueous solvents and flavors are desired.

Syrup (formerly simple syrup); to this one may add an aromatic tincture for flavor.

Syrup of citric acid, and

Syrup of orange are useful for the alkaline salts of the organic acids. Both contain free citric acid and cannot be used with the alkaline carbonates.

Syrup of Cocoa (N.F.) contains 5% of cacao and is flavored with vanilla. It is a useful vehicle for water-soluble drugs and masks many disagreeable tastes.

Syrup of wild cherry,

Syrup of tolu—both of these are much used in expectorant mixtures.

Aromatic syrup of rhubarb,

Syrup of licorice,

Syrup of ginger, are all three particularly suited to children's tastes.

Aromatic Syrup of Eriodictyon (N.F.) is most effective for concealing the taste of quinin. The best results are obtained by suspending the quinin alkaloid or one of its insoluble salts in the syrup as a "shake mixture."

Compound syrup of sarsaparilla is used especially to disguise the taste of the iodids and of the salts of mercury.

Extract of malt is of dense consistence, and may be classed with the syrups. It is useful for suspensions and emulsions.

The **mucilages**, like the syrups and waters, are suitable for water-soluble substances, and, owing to their consistence, are frequently employed in the preparation of emulsions and suspensions.

Mucilage of acacia—this is precipitated by strong alcohol and it contains a slight excess of lime-water, which, being alkaline, may precipitate the salts of alkaloids.

Mucilage of tragacanth—this contains no lime-water, and is miscible with alcoholic preparations, though a light, flocculent precipitate is formed.

## HYDRO-ALCOHOLIC VEHICLES

These are principally the elixirs, and are suitable for prescribing substances which are relatively soluble in either water or dilute alcohol. The alcoholic content of the elixirs is generally about 25 per cent. They are aromatic and sweetened. The most important are:

Aromatic elixir, which is a very serviceable flavoring and vehicle for a wide range of preparations.

Red Aromatic Elixir (N.F.) is the foregoing colored with cudbear.

Elixir of glycyrrhiza—this is the aromatic elixir to which some fluidextract of licorice has been added. It is very useful for disguising the taste of acrid, bitter, and saline drugs. The glycyrrhizin (from the licorice) is precipitated by acids and acid salts, and hence these must not be used with this as vehicle.

Elixir Glycyrrhizae Aquosum (N.F.). This aqueous elixir of glycyrrhiza contains only about 3 per cent of absolute alcohol, and belongs properly among the aromatic syrups. As a vehicle it serves essentially the same purposes as the elixir of glycyrrhiza but does not dissolve such drugs as require diluted alcohol.

## ALCOHOLIC VEHICLES

These are suitable either as vehicles and flavoring agents for substances which are soluble in rather strong alcohol, or as flavors to be added in small amounts to other vehicles, such as syrups and elixirs. The alcoholic content is usually 50 per cent. or over. The two main classes are spirits and tinctures.

Tincture of sweet orange  
Tincture of bitter orange  
Tincture of lemon peel  
Tincture of cardamom  
Compound tincture of cardamom

Compound tincture of lavender  
Tincture of vanilla  
Compound tincture of gentian  
Tincture of calumba



The most commonly used spirits are:

Spirit of anise	Compound spirit of orange
Spirit of lavender	Spirit of peppermint
	Spirit of spearmint

### COLORING

What has already been said concerning the desirability of suitable flavoring is equally applicable to coloring. Coloring is, however, simpler than flavoring and in many cases the vehicle chosen as the flavoring agent also provides the color. This is the case with the elixir of glycyrrhiza, the compound tincture of cardamom, the compound tincture of lavender, and a number of other tinctures, the syrup of wild cherry, the compound syrup of sarsaparilla, and the extract of malt, and others.

Various colors may be imparted to a prescription as will be shown later. Blue is possible, but it should be avoided, as it is commonly reserved as a distinctive color for solutions of the bichlorid of mercury for external use. Bright green is sometimes seen in the case of ferrous salts and the alcoholic preparations of some of the vegetable drugs, in the manufacture of which no heat has been used.

For the purpose of artificially coloring prescriptions certain preparations may be used, some of which are suitable for alkaline and neutral prescriptions, and others for such as are acid in reaction. It is so seldom necessary to color the solid preparations artificially that these will not be considered; coloring agents for liquid prescriptions alone will be given.

## COLORING AGENTS

In the following paragraphs the several more commonly used coloring agents will be discussed briefly with reference to the conditions under which they may be employed. The amounts stated to give a definite color are those required for a 50 c.c. (2 ounce) prescription and the name of the color refers to the plate of Typical Colors given in the 1903 edition of Funk and Wagnalls' Standard Dictionary facing p. 1722. The matching was made with dilutions of fresh samples of the several agents, secured from a reliable source, but it should be remembered that these preparations are not standardized and that different samples may therefore give somewhat different shades of tinting. It is not necessary that precision be used in the amounts of the coloring agents employed as a general rule, and other shades than those to be mentioned can readily be secured. If one chooses to adopt a distinctive coloring for his prescriptions he should then determine for himself the amount of the agent which must be used, or select one of the following, and adhere to it.

**Tinctura Cardamomi Composita.**—This contains cochineal and the remarks made below under Liquor Cocci apply to the use of this preparation. It also contains about 50 per cent. of alcohol and is miscible without precipitation with both aqueous and alcoholic solutions. A pale heliotrope can be obtained with 1 c.c. (15 minims), or a brilliant cherry with 5 c.c. (1¼ drams).

**Liquor Carmini** (N.F.).—This is suitable for coloring both neutral and alkaline preparations, either aqueous or alcoholic. It cannot be used in the presence of acids or acid salts as these precipitate the coloring matter. A very pleasing pale rose color may be obtained from as little as 0.01 c.c. (about  $\frac{1}{6}$  minim), and a dark rose from 0.1 c.c. ( $1\frac{1}{2}$  minims).

**Liquor Cocci** (N.F.).—This is also miscible with both aqueous and alcoholic preparations and in dilute solutions is not precipitated by acids. It is stated to be suitable for either neutral or alkaline solutions as well, but with the latter it sometimes fades quite rapidly. In neutral or alkaline solution 0.1 c.c. ( $1\frac{1}{2}$  minims) gives a rose color and 0.25 c.c. (4 minims) a magenta. In acid solution the same amounts give pale or dark pink, respectively.

**Tinctura Persionis** (N.F.).—This is miscible with both alcoholic and aqueous preparations and can be used for acid, alkaline or neutral solutions, although the reaction alters the color produced. In acid solutions 0.1 c.c. ( $1\frac{1}{2}$  minims) gives a pale pink and 0.3 c.c. (5 minims) a bright pink color. In alkaline solutions the colors are mauve and lilac, respectively, with these amounts, while in neutral solutions mauve and heliotrope are produced.

**Tinctura Persionis Composita** (N.F.).—This has the same range of miscibility as the preceding, but it contains caramel and hence gives brownish colors. The colors are the same, irrespective of the reaction of the solution. With

0.25 c.c. (4 minims) the shade is buff and with 1 c.c. (15 minims) a pleasing ochre is produced.

**Tinctura Caramellis** (N.F. IV).—This is a 10 per cent. solution of caramel in about 25 per cent. alcohol and is compatible with both aqueous and alcoholic prescriptions, irrespective of their reaction. A pale ochre is produced by 0.5 c.c. ( $7\frac{1}{2}$  minims) and a bright ochre with 1 c.c. (15 minims).

**Tinctura Lavandulæ Composita**.—This preparation can be used with acid, alkaline and neutral prescriptions, but it gives a precipitate with water which must be removed by filtration. With alcoholic and hydro-alcoholic preparations it gives a clear solution. A light fawn color is produced by 1 c.c. (15 minims) and a brilliant orange by 5 c.c. ( $1\frac{1}{4}$  drams).

**Tinctura Croci** (N.F.).—This is not precipitated by water and is suitable for coloring both aqueous and alcoholic prescriptions, irrespective of their reaction. A straw color is produced by 5 c.c. ( $1\frac{1}{4}$  drams) and a brilliant canary by twice that amount.

**Tinctura Hydrastis** (N.F.).—This is precipitated by water, but is miscible with alcoholic and hydro-alcoholic preparations, regardless of their reaction. The aqueous solutions can be cleared by filtration and retain their color, though slightly more is required for them than for the alcoholic to give the same shade. In alcoholic solution 0.5 c.c. ( $7\frac{1}{2}$  minims) gives a brilliant lemon and 2 c.c. (30 minims) a bright yellow color.

## NOTES

There are certain points in prescription writing which are quite important but which cannot properly be brought under any of the previous divisions without causing a certain degree of confusion. They are, therefore, assembled here for brief discussion.

**Detailed directions to the patient** may be omitted from the signatura in the case of prescriptions for vaginal or urethral application, etc.; that is, when the directions would be of such a nature that their presence on the label would unnecessarily offend the modesty of the patient. Under these conditions it is customary to order the prescription to be used "as directed." When such is done, the physician, should give the detailed directions for the use of the prescription to the patient *in writing*, and if the prescription is one that would be poisonous or otherwise dangerous if taken internally, he should direct it to be labeled "for external use only," or should order a poison label to be placed upon the container. It is also often advisable to omit the patient's name from the prescription for the same reasons that call for the omission of the detailed directions for use.

When mixtures or suspensions are ordered, and the insoluble matter is likely to precipitate on standing, it is best to order the preparation to be well shaken before it is used. Such an order is commonly given in the singatura by simply writing, "**shake well.**" While it is the duty of the physician to indicate that such a direc-

tion be given to the patient, if it has been overlooked it is probable that the pharmacist will put such a label on the bottle without a special order.

The word "**poison**" may be directed to be put upon the label of the prescription by inserting it in the signatura. Its use is advisable in the case of preparations for external use which would be dangerous if taken internally, for preparations of very toxic drugs in which great care is to be observed in the measuring of the dose, and in the case of prescriptions which, while not very dangerous for the adult, are likely to be so should they fall into the hands of children, or such as have an appearance similar to one or another of the common household remedies and which are, therefore, likely to be mistaken for them.

In addition to the use of the word "**poison**" on preparations for external use, or in the absence of this direction, it is best to specify in the signatura, "**external use only.**" It is advisable, when prescribing a poisonous drug for external or internal use, to have it dispensed in one of the special poison bottles, if such is obtainable. These are bottles of unusual shapes, and are generally distinctively colored.

The custom of having prescriptions refilled once or many times is very common, and it is highly advisable for the physician specifically to order that such shall not be done in the case of dangerous drugs. Some physicians have such an order printed on their prescription blanks, but this is not necessary, as the writing

of the words, "**ne repetatur**," or the abbreviation, **ne rep.** in some conspicuous place on the prescription will prevent its being refilled. It should be borne in mind, also, that the elixirs are moderately alcoholic (25 per cent. alcohol), and are, for the most part, very pleasant to the taste; hence they should not be continued for too long a time even if unfit for use as beverages.

**Prescriptions for Narcotics.**—Under the provisions of a federal internal revenue law bearing on the sale, dispensing, etc., of opium or coca or their derivatives, preparations, etc., which went into effect on March 1, 1915 and which is commonly spoken of as the "Harrison Act," certain special points must be observed in the writing of prescriptions which call for the use of any of these narcotics. Each physician must be licensed, and with the granting of this license is given a registry number. All prescriptions coming under the scope of this law must comply with the following requirements:

1. They must be signed by the name of the physician *in full*.
2. The physician's registry number must be given on the prescription.
3. The date must be given, as of the day when the prescription was written and signed.
4. The address of the physician's office must be stated.
5. The full name and address of the patient must be given. Such a prescription would appear as follows:

JOSEPH SMITH, M.D.  
10 Jones Place,  
New York,  
N. Y.

R.

Opii Pulverati.....0.065

Bismuthi Subcarbonatis.....1.0

M. et fac tales chartulasNo. x

Sig.—Take one powder three times daily.

For,

MRS. CHARLES ROBERTS,  
82 Bridge Avenue,  
New York.

JOSEPH SMITH,  
June 6, 1917.

Federal Registry No. 939

The law provides that prescriptions of this type must not be refilled. Other requirements and restrictions govern the prescribing of these narcotics, but as these have no bearing on the form or construction of the prescription they are not germane to this work.

### **Prescriptions for Alcoholic Preparations.—**

The Volstead Act, passed for the enforcement of the Eighteenth Amendment to the Constitution of the United States, requires each physician who would prescribe alcoholic beverages to register with the Federal Prohibition Director of his state annually and secure a permit. "Beverage" preparations may then be prescribed, under certain specific limitations, and can be written for only on the Official Blanks furnished by the Director.

In addition to "Beverage" preparations certain U.S.P. and N.F. preparations can be prescribed only by physicians holding a permit, unless a sufficient quantity of an active therapeutic agent is added to make them unfit for beverage purposes; that is, there must be a full



dose of the active therapeutic agent per ounce. "Beverage" preparations may also be prescribed if similarly medicated. No permit is required for prescribing such medicated preparations, and they must not be ordered on the Official Blank, but on the physician's own blank. Such a prescription must contain the name and address of the patient, of the physician, and of the pharmacist who is to fill it. Prescriptions of this type cannot be refilled.

The Official U.S.P. and N.F. preparations which cannot be prescribed without a permit or unless medicated are:

Elixir Aromaticum

Elixir Aromaticum Rubrum

Spiritus Myrciæ Compositus

Tinctura Aurantii

Tinctura Caramellis (N.F. IV)

Tinctura Cardamomi Composita

Tinctura Lavandulæ Composita

When one has a patient who is too poor to pay the regular price for his prescriptions, and for whom one, therefore, desires to secure the lowest price from the pharmacist, the abbreviation "Pp.," which stands for *pauperissimus*, may then be written on the prescription. One should never do this, however, when he is receiving a fee from the patient for his own services.

## CHAPTER VIII

### INCOMPATIBILITY

THE application of a slight knowledge of chemistry, and the observation of some very common facts of solubility and miscibility, form the basis for the avoidance of most incompatibilities.

**Definition.**—Substances are said to be incompatible when they are incapable of existing together harmoniously; that is, when they undergo mutual interaction, either chemic or physical; when they are mutually immiscible or insoluble; or when they antagonize one another in action.

For the purpose of prescription writing incompatibility may be considered as being of one of four classes:

1. **Chemic**: Which involves a chemic interaction between the ingredients.

2. **Physical**: Which occurs when there is a change in the physical state of one or more of the ingredients, such as precipitation, liquefaction, etc.

3. **Pharmaceutic**: Occurs when either a chemic or a physical change takes place, which, while not affecting the medicinal properties of the preparation, renders it unsightly, nauseous, or otherwise unsuitable for administration.

4. **Therapeutic**: Occurs when the actions of the ingredients which are incompatible are an-

tagonistic. This form of incompatibility will not be considered in these pages, as it calls for a knowledge of pharmacology and therapeutics for its understanding.

In the following outline only the more important and more frequent incompatibilities occurring in the first three classes will be given. For a more detailed consideration of the subject the reader is referred to the work by Ruddiman or to other text-books. The chemic, physical, and pharmaceutic incompatibilities overlap one another to such an extent that a sharp separation cannot be made. Therefore they will not be grouped according to their respective classes in the following list, but the class to which each belongs may be determined readily by a consideration of the preceding definitions. No attempt has been made to deal with the reactions of some of the more complex remedies, such as the arsphenamines, which require special technic for their use. The arrangement of the following list is alphabetic, according to the main classes of drugs and preparations. Where the expression "insoluble" is used, relative insolubility is meant.

### **I. Acids:**

- (a) Mineral acids often displace the organic acids from their salts.
- (b) Almost all acids decompose the carbonates with the liberation of  $\text{CO}_2$ .
- (c) Organic acids, except acetic, when combined with an alkali, generally precipi-

tate the heavy metals, in the form of salts, from their aqueous solutions.

## 2. Alcohol:

- (a) Alcohol, in sufficient concentration, precipitates gums, albumin, and many inorganic salts from their aqueous solutions.
- (b) Inorganic drugs which are insoluble in water are usually also insoluble in strong alcohol.

## 3. Alkalis:

- (a) Free bases and alkaline carbonates and hydroxids precipitate the alkaloids from their salts in aqueous solution.
- (b) Alkalis react with hydrated chloral to form chloroform.

## 4. Alkaloids:

- (a) The salts of alkaloids, with most organic acids, are insoluble in water.
- (b) Alkaloids are precipitated from their salts in aqueous solution by the alkaline carbonates and hydroxids and by free bases.
- (c) Salicylates, benzoates, iodids, and bromids precipitate most alkaloidal salts from their aqueous solutions in combination with themselves.
- (d) Tannic acid or potassium-mercuric iodid precipitates alkaloidal salts from their aqueous solutions.

**5. Carbonates :**

- (a) See Alkalis and (b) under Acids.
- (b) Potassium or sodium carbonate in solution precipitates the salts of all other common metals.
- (c) The bicarbonates of the alkaline earths have about the same incompatibilities as the carbonates.

**6. Chloral hydrate (hydrated chloral) :**

- (a) When triturated in a dry state with camphor, menthol, phenol, and some other substances, hydrated chloral forms a liquid.
- (b) Alkalis react with hydrated chloral to form chloroform.

**7. Chlorates and other oxidizing substances :**

When these are triturated dry with any of a number of organic substances, and substances which are readily oxidized, an explosion may occur.

**8. Epinephrin :**

This is decomposed by alkalis and the alkaline carbonates and hydroxids.

**9. Glucosids :**

These are decomposed by mineral acids, alkalis, and ferments.

**10. Iron :****A. Ferric salts:**

- (a) Are precipitated from aqueous solution by alkaline hydroxids and carbonates

in the form of the reddish ferric hydroxid.

- (b) Tannic and gallic acids give a blue-black solution or precipitate with ferric salts.
- (c) Salicylates and phenol give a violet color in dilute solutions with ferric salts.
- (d) Ferric salts gelatinize acacia in solution.

**B. Ferrous salts:**

Ferrous salts give white precipitates with tannic and gallic acid; these turn black on standing, due to conversion into the ferric.

**II. Mercury:**

- (a) Mercuric salts precipitate alkaloids, glucosids, proteids, tannin, and antipyrin.
- (b) Mercuric salts of the halogens are precipitated by the fixed alkaline hydroxids, the precipitate being yellow.
- (c) Mercurous salts of the halogens are precipitated by the fixed alkaline hydroxids and by lime-water, the precipitate being black.
- (d) The bichlorid of mercury forms the double salt, potassium mercuric iodid, with potassium iodid. This is soluble in an excess of either of the original salts.
- (e) The salts of mercury should not be prescribed in solutions together with the salts of other metals.

**12. Oils :**

- (a) The *fixed oils* and fats form soaps with alkaline hydroxids, metallic oxids, and lime-water.
- (b) The *volatile oils* may be thrown out of aqueous solution by the addition of soluble salts in considerable concentration.

**13. Resins :**

- (a) Resins form soaps with the carbonates and alkaline hydroxids.
- (b) They are precipitated from their alcoholic solutions by water.

**14. Salts of metals :**

The salts of most metals precipitate proteids, tannin, acacia, alkaloids, and some are precipitants of organic substances in general.

**15. Spirits :**

The volatile substance is thrown out of solution by water in the case of all official spirits except those of nitrous ether and ammonia.

**16. Water :**

Water precipitates many alkaloids, some glucosids, neutral and bitter principles, *resins* or *resinous matter*, and *fats* or fatty matter, from their alcoholic solutions.

### 17. Waters (Aquæ):

Some soluble inorganic salts, when added to the aromatic waters in considerable concentration, throw the volatile oil out of solution. This is, in part at least, due to the reduction of temperature caused by the solution of the salt, but is not wholly so.

### GENERAL SUGGESTIONS ON INCOMPATIBILITY

The following general suggestions will be found of value in avoiding the occurrence of incompatibility in prescriptions, and will aid in the learning of the several special groups of incompatibilities:

1. Order only one active drug in a prescription, and use the simplest vehicle possible.

2. Water is the most nearly universal of solvents. It does not dissolve some of the glucosids, many of the alkaloids, neutral and bitter principles, resins and resinoids, fats and fatty matter, and vegetable extractives in general.

3. Alcohol is second only to water in its solvent powers. In general, the active constituents of vegetable drugs are more soluble in alcohol than in water or in diluted alcohol. Alcohol does not dissolve most of the fixed oils, gums, proteids, and, in general, it is not a good solvent for the metallic salts.

4. Glycerin often materially aids the solution of drugs in water, particularly the salts. It does not mix with most of the fixed oils.



5. In general, it is inadvisable to mix strongly alcoholic preparations with water or with aqueous preparations.

6. It is usually equally inadvisable to combine alcohol or alcoholic preparations, unless very dilute, with concentrated solutions of water-soluble substances.

7. Substances familiar as chemic reagents should neither be mixed together nor used in combination with other substances unless in extremely dilute solution.

8. Acids, or substances which are acid in reaction, should not be mixed with alkalis or substances which are alkaline in reaction.

9. In general, all vegetable substances and their galenic preparations contain tannic acid or substances which react as does tannic acid.

10. Whenever there is doubt as to the complete solubility of a drug in the quantity of solvent contained in a single dose of a prescription, it is well to increase the volume of the dose of the prescription by the addition of more of the solvent, or by the introduction of some additional solvent vehicle.

The following substances may be considered as being almost **universally incompatible**:

Strong mineral acids	Potassium permanganate
Strong alkalis	Potassium iodid
Bichlorid of mercury	Arsenic
Nitrate of silver	Tannic acid
Lead acetate	Alkaloids
	Salts of metals

## CHAPTER IX

### MODES OF ADMINISTRATION OF MEDICINAL AGENTS

As there are many different ways of employing medicinal remedial agents, it is deemed advisable to mention some of the more important of them, and to make a few suggestions relative thereto, which may be of use to the prescriber. Only those methods will be discussed which are designed for securing the systemic action of the remedy.

**By Mouth.**—This is much the commonest mode of administration, and, in general, is the most satisfactory. It has the advantage of being easy for the patient, it is usually effective, and, if properly managed, is subject to considerable control. Almost any of the common preparations may be used by mouth. One has to consider several factors, however, in employing this method of administration. Among these may be mentioned the questions of taste of the preparation, absorbability, injury to the gastric mucosa, or its irritation, with consequent nausea and vomiting; solubility of the drug in the vehicle, if fluid; if solid, the ease with which it disintegrates in the stomach and its solubility in the gastric juice; convenience to the patient; and, lastly, the adaptability of the preparation to a given form suitable for administration.

Of all the forms suitable for oral administration, the solution is the best as both disintegration and solubility in the stomach cease to be elements of doubt, and, in general, absorption is readier. Fluid preparations containing alcohol are usually thought to be more readily absorbed from the alimentary tract than are aqueous ones, on account of the mildly irritant action of the alcohol upon the mucous membrane. It must be remembered, however, that the continued use of moderately strong alcoholic preparations may lead to the development of a taste for alcohol, and some persons probably owe the origin of this taste to the indiscriminate use of alcoholic preparations in medicine.

Other than the solutions there are the mixtures, suspensions, emulsions, pills, powders, capsules, cachets, compressed tablets, and tablet triturates, etc., which may be given by mouth.

The dry solid preparations possess an advantage over the liquid ones in being more convenient for carrying and for taking. Some of them, pills and compressed tablets, have the great disadvantage of being often somewhat slowly disintegrated and dissolved in the stomach, and they have even been known to pass undissolved into the intestine, there to remain for days, and even to be found there at autopsy, or to be passed in the feces.\* The other solid preparations mentioned are equally convenient and are readily disintegrated.

\* Some manufacturers however make compressed tablets, even of insoluble substances, which disintegrate rapidly in water.

Is it feasible to coat pills in such a way as to have them pass through the stomach without disintegration, and then to have them broken down in the intestine. This may be accomplished by careful coating with salol or with kaolin. Salol is an active drug and is capable of causing poisoning in moderate quantities. A considerable dose of salol is contained in the coating of a large pill, hence caution should be exercised in the use of such pills. Keratin has enjoyed the reputation of accomplishing the same end, but it is almost impossible to obtain any of the pure product, and it has been shown that much of the commercial keratin does not resist the action of the gastric juice.

Convenience to the patient and the avoidance of disagreeable tastes which can be ill disguised in any other way should constitute the main reasons for the use of the solid preparations rather than the liquid ones.

**By Rectum.**—When, for one reason or another, administration by mouth is not possible or is not desired, a number of drugs may be given by rectum. It is generally advisable to give only those which are soluble in water, salt solution, or very dilute alcohol by this channel. Some may be successfully introduced, however, in the form of emulsions, suspensions, or as suppositories. Drugs which are irritant to mucous membranes should not be given by rectum unless it is desired to have them excite intestinal peristalsis. There is a fallacy perpetuated in many of the text-books regarding the relation of the rectal dose of

a drug to its oral dose. There is no fixed relation which will apply even to a limited class of substances. The appropriate rectal dose must be determined for each individual drug. When a drug is to be given by rectum and is intended for absorption, if in fluid form, the total volume injected should not exceed 120 to 150 c.c. (4 to 5 ounces) for an adult.

**Hypodermic Injection.**—Drugs with small single doses, and such as are soluble in water or salt solution and are relatively non-irritant, may be injected into the subcutaneous tissues, whence they are absorbed. Very dilute alcohol may also be used as the solvent. Some insoluble drugs, as the salicylate of mercury, when injected intramuscularly, are slowly absorbed from the tissues. Some more or less irritant drugs, and many of the soluble drugs, may be injected deep into the muscular tissues of the buttocks or lumbar regions, whence they enter the circulation, usually very rapidly.

Hypodermic injection is a very satisfactory and certain mode of administering many drugs, but there still exists in the minds of many an intimate association between the use of the hypodermic syringe and the administration of morphin or other habit-forming narcotic. Owing to this fact the method must be used with considerable caution, for it has been said to have led to the initiation of the narcotic habit.

The fallacy regarding the relation of the dose for rectal administration to that used by mouth is also to be found in statements as to the ratio

between the hypodermic and oral doses. Again it must be emphasized that no fixed ratio exists, even in the case of different substances of the same class. The suitable hypodermic dose of each drug must be determined by experience alone.

**Intravenous Injection.**—No method is either so certain or so rapid in the production of results as is this. But it requires a considerable degree of skill, a special technic, and is properly applicable to a very limited number of drugs. It is to be borne in mind that one should rarely use more than a single drug in an intravenous injection; that saline solution, approximately isotonic with the blood, and made with freshly distilled water only, should be the solvent of choice; that extreme caution regarding sterility of the solution, instruments, and the skin, both of patient and operator, must be observed; and that the injection fluid must be a perfect solution, absolutely free from insoluble particles of any size. Progress is being made toward the placing of intravenous therapy upon a sound, rational basis. As yet, however, its legitimate field of usefulness is very sharply limited in spite of the fact that it is employed indiscriminately by many.

The other methods of administration are far less commonly used and may be dismissed with a few words. Certain drugs may be given by **inhalation** in the form of a nebula, or very fine spray, or as the vaporized drug. **Fumigation**, or the exposure of the patient to the vapor of a

volatile drug, such as mercury, has been employed, but it has recently been suggested that in this method the absorption of the drug takes place chiefly through the respiratory tract. Medicated **baths** are seldom used at the present time except for the local action of the drug upon the skin. **Inunction**, or the introduction of a drug through the unbroken skin, is most frequently employed in the administration of mercury. Some other drugs can be absorbed through the skin, but they are seldom given in this way. **Cataphoresis** is the introduction of a drug through the unbroken skin or mucous membrane by means of electrolytic dissociation. It is a method rarely used, and requires special technic and apparatus.

In addition to the administration of drugs for their effects after absorption there are many methods of employing them for the sake of their local actions—the ointments, pastes, plasters, lotions, etc., supply the forms for this mode of administration.

## CHAPTER X

### SUGGESTIONS FOR SUITABLE METHODS OF PRESCRIBING OFFICIAL PREPARATIONS

THE difficulties encountered in writing satisfactory extemporaneous prescriptions are due largely to a lack of confidence in one's ability to combine the various drugs and preparations and to make proper use of the vehicles and flavoring and coloring agents. This lack of confidence has been a potent factor in promoting the use of ready-made mixtures and has led many physicians to take much of their therapeutics from the manufacturers of such mixtures, who have no knowledge whatever of rational treatment. This can be corrected best by giving the physician a knowledge of the rudiments of pharmacy. While it is beyond the scope of the present volume to enter into the subject of pharmacy, the following brief suggestions are offered to illustrate some of the methods of combining the several general classes of official drugs and preparations in the form of extemporaneous prescriptions. No attempt has been made to include all of the methods of combination, but the suggestions have been restricted to only the more suitable or the commonest methods and are subject to elaboration at the discretion of the student who cares to perfect



himself in the art of prescribing. At various points reference will be made to the succeeding list of practice prescriptions for concrete illustrations of the suggestions given. The classes considered are taken up in alphabetic order according to their English names.

**Acids.**—The concentrated acids are used mainly for external application as caustics and should be ordered alone. The dilute acids may usually be prescribed in combination with most of the tinctures, the syrups and with many aqueous preparations. They should not be ordered in prescriptions containing the carbonates or other alkaline salts. (R<sub>x</sub> Nos. 20 and 48.) Where the acids are prescribed with active tinctures containing alkaloids these latter are usually converted into the salts of the acids and are generally soluble in the vehicle, whether aqueous or alcoholic.

**Decoctions.**—The strength of these aqueous preparations is fixed by the Pharmacopeia at 5 per cent. and unless otherwise directed they will be made of such strength. The method of preparation is also prescribed in the U.S.P. and all that is necessary is to order the desired drug and direct that a decoction be made. The decoctions may be given alone, or in combination with various aqueous preparations. Water-soluble substances may be prescribed to be dissolved in them. They should always be prepared fresh and should be ordered in amounts to last only a few days on account of their ready decomposition. Some official decoctions are

stronger than 5 per cent. but this difference will be readily learned for the few instances.

**Elixirs.**—These are of two classes: (1) Pleasant vehicles, such as the aromatic elixir and the elixir of glycyrrhiza; and, (2) Medicated elixirs, containing one or more active ingredient. The former class has been discussed under the subject of vehicles. (R Nos. 26, 28, 31, 35, and 37.) They are hydro-alcoholic preparations which have a wide range of usefulness as solvents and pleasant flavoring agents. Various organic and inorganic salts, including those of many alkaloids, may be prescribed in the elixirs, with or without the addition of water or alcohol. The medicated elixirs are usually used alone as pleasant forms for the administration of the contained active ingredients.

**Emulsions.**—As a general rule emulsions should be used alone, though certain other drugs may be added to them, such as the medicated syrups (R No. 39) and various water-soluble drugs. As most of them depend upon acacia for the suspension of the emulsified oil or oleoresin, alcoholic preparations should not be added to them except in small amounts, as alcohol precipitates gum and will destroy the emulsion. Emulsions may be prepared extemporaneously and all that is necessary is to prescribe the dose of the active drug, order acacia, sugar and a flavor in indefinite amounts and complete with the requisite amount of water or syrup, directing the pharmacist to make an emulsion. (R Nos. 27 and 32.) If sugar is not desired, glycerin may be substituted, or small amounts of saccha-

rin, but the addition of sugar increases the viscosity of the menstruum and aids in maintaining the emulsjon.

**Extracts.**—These are best given in the form of pills or, when dry, as powders or in capsules or cachets. They are usually quite active when made from potent drugs and require dilution with other substances. They may also be incorporated in ointments, suppositories and other solid or semisolid preparations. Their use will be mentioned further under the subject of pills. Since they are used almost exclusively in solid preparations the question of pharmaceutical incompatibility seldom arises. (R Nos. 9, 10, 11, and 19.)

**Fluidextracts.**—These may be prescribed as such, but they are ordinarily too potent to be given without some dilution. They are usually prepared with the aid of alcohol and their dilution is generally best accomplished by using some alcoholic menstruum such as a tincture or an elixir. Some few are soluble also in aqueous vehicles. In addition to prescribing them in solution, they may be incorporated with other ingredients to make pills, tablets, suppositories, ointments, etc.

**Fluidglycerates.**—These are official in the N.F. and are of the same strength as fluidextracts. They are made with a menstruum of approximately fifty per cent. each of glycerin and water and can be prescribed with the aqueous vehicles, or with the elixirs. As the dose is usually small they require dilution for con-

venient administration. The fluidglycerate of glycyrrhiza is made with the aid of ammonia and cannot be prescribed with menstrua containing acid, or with acids or acid drugs, as the glycyrrhizin is precipitated by acids.

**Infusions.**—The official infusions may be prescribed alone, or water-soluble drugs may be added to them, such as the salts. (R̄ No. 45.) Like the decoctions, they are prone to undergo fairly rapid deterioration and should not be prescribed in amounts which will last for more than a few days to one week.

**Mixtures.**—These are suspensions of insoluble substances in water with the aid of mucilage. They usually also contain sugar or syrup. They may be ordered prepared extemporaneously by prescribing the desired dose of the drug to be suspended and a sufficient quantity of acacia or mucilage, sugar or syrup, and water to make up the desired volume. (R̄ Nos. 21, 30, and 41.) The pharmacist should be directed to make a mixture and the preparation should be ordered to be shaken well before it is taken. The official mixtures can be combined with a wide range of drugs and preparations, but alcohol, except in small amount, would precipitate the mucilage and too great a dilution would render the suspension of the insoluble substance incomplete. Where tragacanth or its mucilage is used for the suspension alcoholic preparations may be added, as this gum retains its capacity for remaining in suspension and for holding other substances in the presence of alcohol.

**Mucilages.**—These are suitable vehicles for the suspension of insoluble substances in water or for the emulsification of oils and oleoresins. They have been discussed in the chapter on Vehicles as well as in the preceding section.

**Oils.**—The fixed oils or fats are best given in the form of emulsions or inclosed in capsules. (R̄ Nos. 17, 29, and 32.) Some are also suitable for use in ointments.

The volatile oils have their greatest use in the form of the aromatic waters and the spirits, or as flavoring agents, and as such have been discussed in the chapter on Vehicles. (R̄ Nos. 21, 32, and 41.)

**Oleoresins** may be given in the form of emulsions, or incorporated in pills, suppositories, or ointments, or inclosed in capsules. (R̄ No. 27.)

**Pills.**—There are many official pills which may be prescribed as such. The various solid and semisolid, and some of the fluid, official drugs and preparations may be combined in the form of pills. The art of making pills is a complex and difficult one, and the choice of suitable diluents and excipients requires considerable pharmaceutical skill and experience. It is, therefore, better to leave this phase of the prescription to the discretion of the pharmacist, and merely to prescribe the therapeutic ingredients in the desired amounts and direct pills to be made, than to attempt a mastery of the art of choosing the excipients. The extracts, oleoresins, resins, glycerites, and some other official preparations are often best given in pill form. The drugs which

may be chosen for incorporation into pills must be relatively active in order that a sufficient dose may be contained in a small bulk. Pills should not exceed 0.5 Gm. ( $7\frac{1}{2}$  grains) in weight, and may be much smaller than this. When they weigh less than 0.06 Gm. (1 grain) they are usually called granules. Aside from the disadvantages already mentioned regarding the use of pills, it should be remembered that, as they are of fixed size, the graduation of the dose is possible only within rather wide limits, unless a new prescription is written for each change. Pills may be coated with inert powders, gelatin, sugar, etc., for general use, or they may be prepared to pass through the stomach without disintegration by coating them with salol or kaolin, which are not soluble in the gastric juice. The uselessness of keratin for this purpose has already been mentioned. The N.F. gives directions for the extemporaneous coating of pills with gelatin, sugar, cocoa, tolu, silver and salol and it is sufficient merely to direct the pharmacist to coat the pills with the substance desired. When no other coating is ordered the pills will be dispensed with some inert dusting powder such as lycopodium, talc, glycyrrhiza or starch, so that they will not stick together. (R Nos. 9, 11, and 13.)

**Powders.**—Drugs in powdered form may be combined as such and prescribed in capsules or cachets for internal administration, or they may be ordered mixed with water or taken dry on the tongue. Some readily soluble substances may

be prepared in the form of effervescent powders or salts, by the addition of a carbonate and an organic acid, which will react with the liberation of  $\text{CO}_2$  when dissolved. Where the prescription is to be dispensed in capsules each dose should not exceed 0.6 Gm. (10 grains). If the dose is materially larger than this cachets may be used in place of capsules. (R̄ Nos. 8, 10, 14, 15, and 18.)

**Resins.**—The resins are, in general, best given in the form of pills or suppositories. Their taste is usually very disagreeable and not readily disguised in fluid preparations.

**Solutions.**—The official liquors are suitable for administration as such, or they may be combined with other aqueous preparations and water-soluble substances. It must be remembered, however, that the addition of other solid substances, such as salts, may cause the liquors to become supersaturated and result in the precipitation of a portion of one or more of the ingredients.

**Spirits.**—The spirits are generally not used as such, but are added to other preparations as flavoring agents, which use has been mentioned previously.

**Syrup.**—The syrups have been discussed under the head of vehicles in a preceding chapter. (R̄ Nos. 23, 25, 27, and 32, etc.)

**Tinctures.**—These are suitable, in many cases, for administration in their original form. Many can be diluted with water and combined with aqueous preparations; some, however, throw down a heavy precipitate of resinous

matter under these circumstances. Tinctures may be combined with one another or with the elixirs. Substances soluble in moderately concentrated or strong alcohol may be combined with many of the tinctures. The incompatibilities of the alkaloids, glucosids, and tannin must be constantly borne in mind when combining active tinctures with other drugs, or preparations. (R̄ Nos. 20, 22, 31, and 37, etc.)

**Triturates.**—These form a convenient means of administering active solid drugs which can be reduced to a fine powder. They are solid, and when made into tablets have many of the advantages of pills, in addition, disintegrating readily in the stomach. They may be ordered to be made extemporaneously by prescribing indefinite amounts of milk sugar and alcohol, along with the specified amount of the active constituents, and directing the pharmacist to prepare tablet triturates. (R̄ No. 16).

**Vinegars.**—The vinegars may be prescribed in aqueous, syrupy, or mildly alcoholic vehicles or with other preparations having these characteristics. They may also be used in combination with some of the tinctures. As they are acid in reaction, they should not be combined with alkalis or alkaline substances.

**Waters.**—The waters are used chiefly as vehicles, and as such have already been discussed. (R̄ No. 41.)

**Wines.**—The official wines are usually very pleasant forms for the administration of the drugs which they contain.



## PREPARATIONS FOR EXTERNAL USE

The **cerates**, **oleates**, and **ointments** are waxy or oleaginous preparations which are intended for external application, and which, in general, contain medicinal agents intended for their local action at the site of application. Some are intended for absorption. The medicament may be in the form of an extract, alkaloid, volatile oil, or metallic salt, etc. The base is such that it will remain solid or semisolid at ordinary room temperature, but will melt or soften at that of the body. Bland, inert fats and oils, with or without added waxes, are the usual excipients. The simple cerate (*Ceratum*) of the U.S.P. provides an excellent basis for the extemporaneous preparation of medicated cerates, while for ointments white petrolatum, ointment of rose water, wool fat and benzoinated lard are the commonest and most satisfactory bases. (R Nos. 1 and 2.)

**Cataplasms** or poultices are used as means of applying moist heat, and are usually devoid of inherent medicinal properties. Flaxseed is the commonest in use. In some instances they are supposed to exert a local medicinal action, or even to provide a means of bringing about the absorption of a drug. They probably, however, do not accomplish the latter result.

The **glycerites** are mixtures of glycerin with starch or some active medicinal agent, and are intended for local effect at the site of application. The glycerite of starch is often used as an excipient in making pills.

**Liniments** are intended solely for external application, usually with friction. They commonly contain some local irritant, such as turpentine, camphor, etc. They are usually partly volatile, and are soapy or oleaginous, to provide lubricant properties for the application of friction. Liniments may be prepared extemporaneously by using the official soap liniment as a solvent for the drug desired, which is usually one of the volatile oils or stearoptens. (R̄ No. 4.)

**Lotions** or washes are aqueous medicated preparations designed for the local action of their medicinal constituents. They are generally somewhat germicidal or mildly antiseptic in action. (R̄ No. 5.)

**Medicated papers** are either intended for local application, as the official *emplastrum sinapis*, or they may be burned for the effects of their fumes, as the potassium nitrate paper.

**Plasters** and **pastes** have higher melting points than the ointments and oleates, and are not intended to melt at the body-temperature. Lead plaster is the common basic ingredient of the former, while that for the pastes is usually the official (N.F.) *pasta dextrinata*.

**Powders** are combinations of drugs in powdered form, and may be used as dusting-powders or protectives (R̄ Nos. 7 and 8), or some of them, such as the common licorice powder, may be intended for internal administration.

**Suppositories** are solid medicated preparations for insertion into the open body cavities, where they may exert their local action, or

whence they may become absorbed. Cocoa-butter or a stearate soap with glycerin is probably the commonest base. Fluidextracts, extracts, oleoresins and various other preparations may be prescribed in the form of suppositories. A prescription for their extemporaneous preparation need merely state the desired dose of the active ingredient, along with an indefinite amount of cocoa butter. They should not exceed 4.0 Gm. (1 dram) in weight, and are better if about half as large. (R<sub>y</sub> No. 19.)

**Troches** are solid preparations containing medicinal agents for local action in the buccal and adjacent cavities. They are usually demulcent or astringent, and are to be dissolved slowly in the saliva. These may be ordered prepared extemporaneously by prescribing indefinite amounts of tragacanth, sugar, water and a flavoring agent, such as vanillin or one of the volatile oils, along with the desired amount of the active ingredient. The pharmacist should be directed to make troches. (R<sub>y</sub> No. 12.)

The brief suggestions which have been given are merely intended to call attention to the methods of using the several official types of preparations, and should be amplified in each instance by consulting the Pharmacopœia or National Formulary, or a text-book on pharmacology and therapeutics. The incompatibilities previously discussed must, of course, be borne in mind when making original combinations with any of the preparations. A knowledge of pharmacology and therapeutics is necessary for the full appreciation of the suggestions outlined.

## CHAPTER XI

### PRACTICE PRESCRIPTIONS

THE following prescriptions are presented primarily to give the student some practice in applying the directions given in the preceding pages. They have been chosen, also, with other ends in view, namely:

1. As fairly representative of the modern simple prescription.
2. To illustrate several of the commoner types of prescriptions for various purposes.
3. To give concrete examples of certain of the suggestions made in Chapter X, in which references to them are made.

The doses ordered have been stated in many instances in both systems of weight and measure so that the prescriptions may be written in either the Metric or the Apothecaries' system, as the instructor may direct. A few examples of incompatibility have also been given for practice in prescribing.

Write prescriptions according to the following directions:

#### FOR LOCAL EXTERNAL APPLICATION

1. For 30 Gm. of an ointment to contain 5 per cent. of methyl salicylate in white petro-

latum, or other suitable base. Direct it to be rubbed into the skin thoroughly for the relief of pain. For external use only. Use the metric system.

2. For half an ounce of an ointment to contain 6 per cent. of salicylic acid and twice as much benzoic acid, in equal parts of lanolin and of white petrolatum. Direct it to be applied with thorough rubbing. Use the Apothecaries' system.

3. For 50 c.c. of a collyrium to contain 2 per cent of boric acid and 0.5 Gm. of sodium chlorid in equal parts of camphor water and distilled water. To be used as an eye-wash with an eye cup. Use the metric system.

4. For four ounces of a 2 per cent. solution of menthol in chloroform liniment. Direct it to be used externally with vigorous friction.

5. For a lotion to contain 2 per cent. of phenol, 4 per cent. of glycerin, and 8 per cent. each of zinc oxid and of prepared calamine. Use water as the vehicle. Prescribe 100 c.c. and direct it to be applied to the skin and allowed to dry on.

6. For a one-half of one per cent. aqueous solution of zinc sulphate to be used as eye drops. Prescribe 15 c.c. ( $\frac{1}{2}$  ounce). Write in the percentage form.

7. For an antiseptic dusting-powder to contain 2 per cent. of salicylic acid and twice as much boric acid in equal parts of stearate of zinc and purified talcum. Direct it to be used externally as a dusting powder.

## PREPARATIONS FOR INTERNAL ADMINISTRATION

## A. Solid:

8. For two ounces of compound licorice powder. Direct one teaspoonful to be taken nightly, stirred up in water. Use the metric system.

9. For laxative pills, each to contain 8 mgm. ( $\frac{1}{8}$  grain) of aloin, twice as much extract of belladonna and 0.12 Gm. (2 grains) of extract of cascara sagrada. Order them to be coated with gelatin. Direct one or two to be taken at bedtime. Write this prescription for the whole number and order divided into 12 pills.

10. For antidiarrheal powders each to contain 16 mgm. ( $\frac{1}{4}$  grain) of extract of opium and 2 Gm. (30 grains) of bismuth subcarbonate. Direct them to be taken dry on the tongue and swallowed with the aid of water.

11. For fifty pills, each to contain 1 milligram ( $\frac{1}{60}$  grain) of arsenic trioxid; 0.06 Gm. (1 grain) of extract of rhubarb; and 0.3 Gm. (5 grains) of mass of ferrous carbonate. Order them to be dusted with lycopodium. Direct one to be taken after each meal.

12. For fifteen of the official troches of ammonium chlorid. Direct one to be used every two hours.

13. A prescription for 30 pills of ipecac contains 9 Gm. ( $2\frac{1}{2}$  drams) of the drug. Write the prescription as for a single pill and direct 30 such pills to be made. Direct them to be coated with salol. Prescribe three to be taken three times daily.

14. A hypnotic for use in the presence of pain, each dose to contain 0.03 Gm. ( $\frac{1}{2}$  grain) of codein and 0.06 Gm. (10 grains of trional.

Order dispensed in cachets. Direct one to be taken an hour before bedtime.

15. An analgesic for neuralgic headache, each dose to contain 0.2 Gm. (3 grains) each of aspirin and phenacetin and 0.065 Gm. (1 grain) of caffein. Dispense in capsules. Direct one to be taken every four to six hours for relief of headache.

16. Tablet triturates to be made, each to contain 2 mgm. ( $\frac{1}{30}$  grain) of strychnin sulphate diluted with milk sugar. Order one to be taken every four hours during the day and prescribe enough to last about one week.

17. An antifermentative prescription, each dose to contain 0.16 Gm. ( $2\frac{1}{2}$  grains) of salol and an equal amount of castor oil. Order dispensed in soft capsules. Direct one to be taken every four hours.

18. For antacid, laxative powders, each to contain 0.6 Gm. (10 grains) each of magnesium oxid and of bicarbonate of soda. Write for the total amounts of each ingredient and order the prescription to be divided into 20 powders. Direct one to be taken an hour after each meal.

19. For astringent suppositories, each to contain 0.3 Gm. of tannic acid and 0.12 Gm. of extract of belladonna. Use oil of theobroma as the base. Write in the Apothecaries' system. Order 15 to be made, and direct that one shall be used night and morning.

**B. Liquid:**

20. A bitter stomachic, each teaspoonful dose to contain 0.6 c.c. (10 minims) each of dilute hydrochloric acid and tincture of nux vomica, using the compound tincture of gentian as the vehicle. Direct it to be taken in a wine glass of water immediately before each meal.

21. An antacid mixture, each tablespoonful dose to contain 0.6 Gm. (10 grains) of bismuth subcarbonate, twice as much magnesium oxid, and 2 Gm. (30 grains) of bicarbonate of soda, to be suspended in water with the aid of acacia and flavored with saccharin and oil of peppermint. Order to be taken one hour after each meal. Direct to be shaken well.

22. A carminative bitter, each dose to contain 0.3 c.c. (5 minims) of tincture of capsicum, twice as much tincture of nux vomica, and 1 c.c. (15 minims) of tincture of ginger, using the tincture of calumba as the vehicle. Direct one teaspoonful to be taken in half a wine glass of hot water half an hour after each meal.

23. The adult's dose of syrup of ipecac is 1 c.c. (15 minims); of citrate of potash it is 1 Gm. (15 grains). Prescribe an expectorant for a child 13 years old, weighing 75 pounds. Use equal parts of syrup and of distilled water as the vehicles. Direct two teaspoonfuls to be taken every four hours, and order enough to last four days.

24. A solution of sodium nitrite in distilled water, each teaspoonful dose to contain 2 grains of the nitrite. Order a teaspoonful to be taken



every four hours, and prescribe enough to last two days. Use the metric system.

25. A pleasant antacid laxative for a child, each teaspoonful dose to contain 0.3 Gm. of magnesium oxid in aromatic syrup of rhubarb. Order 30 c.c., and direct one teaspoonful to be taken night and morning.

26. A solution, each teaspoonful dose to contain 0.25 Gm. of iron and ammonium citrate in equal parts of aromatic elixir and of water as the vehicles. Order a teaspoonful to be taken after each meal. Tint ochre, and prescribe enough to last ten days. Use the Apothecaries' system.

27. An anthelmintic emulsion, each tablespoonful dose to contain 4 Gm. (1 dram) of oleoresin of aspidium, 2 c.c. (30 minims) of spirit of chloroform, and 4 c.c. (1 dram) of glycerin, suspended in syrup of ginger with the aid of acacia. Prescribe enough for only two doses. Order taken on an empty stomach.

28. A hypnotic, each teaspoonful dose to contain 15 minims of paraldehyd. Use red aromatic elixir as the vehicle. Direct one or two teaspoonfuls to be taken at bedtime. Order enough to last about a week.

29. A single dose of 1 c.c. (15 minims) of oil of chenopodium in castor oil to make 30 c.c. (1 ounce). To remove round worms. Direct to be taken on an empty stomach.

30. An antemetic mixture, each tablespoonful dose to contain 0.03 c.c. ( $\frac{1}{2}$  minim) of phenol; 0.3 c.c. (5 minims) of glycerin; and 2 Gm.

(30 grains) of bismuth subnitrate. Suspend appropriately in water. Direct a dose to be taken every hour, and order enough for four doses.

31. An alkaline prescription to allay bladder irritation, each teaspoonful dose to contain 0.6 Gm. (10 grains) of potassium citrate and 2 c.c. (30 minims) of tincture of hyoscyamus, using equal parts of water and aromatic elixir as the vehicles. Direct it to be taken four times daily.

32. An emulsion of castor oil for a child, each tablespoonful dose to contain 6 c.c. ( $1\frac{1}{2}$  drams) of castor oil, emulsified in syrup with the aid of acacia and flavored with oil of cinnamon. Order a dose to be taken at night when needed.

33. An antiseptic to acidulate the urine, each teaspoonful dose to contain 1 Gm. (15 grains) of sodium benzoate dissolved in water. Flavor with methyl salicylate and color rose. Order a dose taken four times daily and prescribe enough to last about one week.

34. A sedative for cough, each teaspoonful dose to contain 0.01 Gm. ( $\frac{1}{6}$  grain) of codein phosphate and 1 c.c. (15 minims) of glycerin. Use syrup of wild cherry as the vehicle. Direct to be taken every four hours.

35. A cough mixture, each teaspoonful dose to contain 10 minims of spirit of chloroform and 30 minims of anisated spirit of ammonia, in elixir of licorice as the vehicle. Order a dose to be taken every three hours (five per day), and prescribe enough to last about a week. Write in the metric system.

36. A nauseant expectorant to liquefy the bronchial secretion, each teaspoonful dose to contain 0.3 Gm. (5 grains) of ammonium chlorid and 1 mgm. ( $\frac{1}{60}$  grain) of tartar emetic, using syrup of orange as the vehicle. Direct to be taken every three hours until nausea develops, then three times daily.

37. An antiasthmatic to relax bronchial spasm, each teaspoonful dose to contain 0.6 Gm. (10 grains) of potassium iodid and 0.3 c.c. (5 minims) of tincture of belladonna, in elixir of glycyrrhiza as the vehicle. Order to be taken four times a day and followed by half a glass of milk or water.

38. Prescribe Fowler's solution diluted with distilled water so that each teaspoonful dose will contain 0.2 c.c. (3 minims) of the preparation. Direct to be taken three times daily after meals in a small amount of water.

39. A hematinic tonic for a child, each tablespoonful dose to contain 1 c.c. (15 minims) of the syrup of the iodid of iron in the official (N.F.) emulsion of cod-liver oil with malt. Direct to be taken after each meal.

40. A suspension of quinin disguised in aromatic syrup of eriodictyon, each teaspoonful dose to contain 0.3 Gm. (5 grains) of quinin. Direct to be taken every four hours, and to be shaken before using.

41. An astringent, antidiarrheal mixture, each tablespoonful dose to contain 0.5 Gm. of prepared chalk; 2 c.c. of tincture of kino; 0.4 c.c. of spirit of chloroform; and 3 c.c. of spearmint

water. Suspend appropriately, and use syrup as the vehicle. Prescribe a tablespoonful to be taken every two hours for four doses.

42. A solution of the red iodid of mercury as formed in the following mixture: Bichlorid of mercury, 3 milligrams ( $\frac{1}{20}$  grain); potassium iodid, 0.3 Gm. (5 grains); water to make 4 c.c. (1 dram). The amounts are for a single dose, which is to be taken in milk or water after each meal. Prescribe enough to last ten days.

43. A solution of theobromin sodium salicylate in water, each teaspoonful dose to contain 1 Gm. Tint the solution heliotrope. Prescribe a teaspoonful to be taken three times daily, and order enough to last five days.

44. A cough mixture for an adult contains 2 Gm. (30 grains) of antipyrin; 4 Gm. (1 dram) of sodium bromid; 6 c.c. ( $1\frac{1}{2}$  drams) of tincture of belladonna; and 15 c.c. ( $\frac{1}{2}$  ounce) of syrup of wild cherry; in water to make the total prescription measure 60 c.c. (2 ounces). The dose is a teaspoonful every four hours. Reduce this prescription to suit a child weighing 50 pounds.

45. Order 250 c.c. (8 ounces) of a 5 per cent. infusion of buchu to be prepared fresh, and direct the pharmacist, after filtering it, to dissolve in it enough potassium acetate to provide 1 Gm. (15 grains) in each dose of two tablespoonfuls. Direct a dose every four hours.

46. Although sodium biphosphate decomposes methenamin (hexamethylenamin) it is desired to give a patient 1 Gm. (15 grains) of methenamin every four hours, and to insure

an acid urine by administering a similar dose of sodium biphosphate every four hours. The drugs must be given in solution. Prescribe suitably.

47. Concentrated solutions of very soluble salts and of irritant drugs are likely to cause nausea or vomiting. Prescribe a solution, each dose of which is to contain 0.3 Gm. (5 grains) of chloral hydrate and 2 Gm. (30 grains) of sodium bromid. Order a dose to be taken at bedtime.

48. A patient with gastric indigestion and flatulence requires doses of 1 c.c. (15 minims) of dilute hydrochloric acid to aid digestion, and of 0.03 Gm. ( $\frac{1}{2}$  grain) of capsicum and 0.5 Gm. ( $7\frac{1}{2}$  grains) each of sodium bicarbonate and charcoal to control the flatulence. Prescribe appropriately.

49. A rheumatic patient is anemic and requires 0.25 Gm. (4 grains) of ferric phosphate after each meal for his anemia, as well as 1.3 Gm. (20 grains) of sodium salicylate three times a day. The drugs must be given in solution. Prescribe suitably.

50. It is desired, in the control of an obstinate dysentery, to administer at four-hour intervals doses of 0.5 c.c. ( $7\frac{1}{2}$  minims) of tincture of opium; 2 Gm. (30 grains) of bismuth subnitrate; and about 15 c.c. ( $\frac{1}{2}$  ounce) of chalk mixture. Prescribe appropriately.



## INDEX

- ABBREVIATIONS, 21, 40  
table of, 41
- Accusative case, general  
rules for formation  
of, 30  
use of, 49
- Acids, incompatibility of,  
111  
methods of prescribing,  
125
- Adjectives, 32  
declension of, 32
- Adjuvant of prescription, 69
- Administration by cata-  
phoresis, 123  
by fumigation, 122  
by inhalation, 122  
by inunction, 123  
by medicated baths, 123  
by mouth, 118  
by rectum, 120  
hypodermic, 121  
intravenous, 122  
methods of, 118
- Adverbs, 39
- Age and dosage, 90
- Alcohol, incompatibility of,  
112
- Alcoholic preparations,  
prescriptions for, 108  
vehicles, 100
- Alkalis, incompatibility of,  
112
- Alkaloids, incompatibility  
of, 112
- Ana or āā, uses of, in pre-  
scription writing, 84
- Apothecaries' system, 56,  
65  
calculation for, in pre-  
scription writing, 83  
conversion of, into  
metric system, 64  
methods of calculation  
for use when writing  
in, 77
- Aquæ, 98  
incompatibility of, 116
- Aqueous vehicles, 98
- Aromatic waters, 98
- BASIS of prescription, 69
- Baths, medicated, admin-  
istering drugs by, 123
- British Pharmacopœia, 19
- CALCULATION, methods of,  
when writing in  
apothecaries' system,  
77  
of amount of each ingre-  
dient, 73

- Capitalization of words in official titles, 46
- Carbonates, incompatibility of, 113
- Cataphoresis, administering drugs by, 123
- Cataplasms, methods of, prescribing, 133
- Centimeter, cubic, 58
- Cerates, methods of prescribing, 133
- Chemic incompatibility, 110
- Children, doses for, 95  
     Clark's rule, 95  
     Cowling's rule, 96  
     Dilling's rule, 96  
     Gabius' rule, 96  
     Young's rule, 95
- Chloral hydrate, incompatibility of, 113
- Chlorates, incompatibility of, 113
- Clark's rule for doses for children, 95
- Classification of prescriptions, 86
- Coloring, 101, 102  
     agents, 102  
         liquor carmini, 103  
         cocci, 103  
         tinctura caramellis, 104  
         cardamomi composita, 102  
         croci, 104  
         hydrastis, 104  
         lavandulæ composita, 104  
         persionis, 103
- Coloring agents, tinctura persionis composita, 103
- Conjugation of verbs, 33
- Conjunctions, 39
- Construction of prescriptions, 71
- Corrective of prescription, 70
- Cowling's rule for doses for children, 96
- Cubic centimeter, 58
- DECLENSION of adjectives, 32  
     of nouns, 25-31
- Decoctions, methods of prescribing, 125
- Dilling's rule for doses for children, 96
- Directions to patient, 105
- Disease and dosage, 92
- Dosage, 89  
     age and, 90  
     disease and, 92  
     for children, 95  
         Clark's rule, 95  
         Cowling's rule, 96  
         Dilling's rule, 96  
         Gabius' rule, 96  
         Young's rule, 95  
     idiosyncrasy and, 91  
     sex and, 91  
     weight and, 90
- Drugs, administration of, methods, 118  
     doses of, 89  
         age and, 90  
         disease and, 92  
         for children, 95  
             Clark's rule, 95



- Drugs, doses of, for children, Cowling's rule, 96  
 Dilling's rule, 96  
 Gabius' rule, 96  
 Young's rule, 95  
 idiosyncrasy and, 91  
 sex and, 91  
 weight and, 90  
 official, 20
- ELIXIRS, methods of prescribing, 126
- Emulsions, methods of prescribing, 126
- Epinephrin, incompatibility of, 113
- Excipient of prescription, 69
- Extemporaneous prescription, 87
- External application, local, practice prescriptions for, 136  
 use, 106  
 preparations for, 133
- Extracts, methods of prescribing, 127
- FLAVORING, 97
- Fluid prescriptions, 88
- Fluidextracts, methods of prescribing, 127
- Fluidglycerates, methods of prescribing, 127
- Formulary, National, 19
- Fumigation, administering drugs by, 122
- GABIUS' rule for doses for children, 96
- Galenical preparations, 20
- Gender in Latin, 24
- Genitive case, general rules for formation of, 29  
 use of, 47, 48
- Glucosids, incompatibility of, 113
- Glycerites, methods of prescribing, 133
- Gram, 58
- Grammar, Latin, 23
- Grammatic construction, 45
- HOUSEHOLD measures, 68
- Hydrated chloral, incompatibility of, 113
- Hydro-alcoholic vehicles, 100
- Hypodermic injection, 121
- IDIOSYNCRASY and dosage, 91
- Incompatibility, 110  
 chemic, 110  
 definition of, 110  
 general suggestions on, 116  
 of acids, 111  
 of alcohol, 112  
 of alkalis, 112  
 of alkaloids, 112  
 of aquæ, 116  
 of carbonates, 113  
 of chloral hydrate, 113  
 of chlorates, 113  
 of epinephrin, 113  
 of glucosids, 113  
 of iron, 113  
 of mercury, 114

- Incompatibility of oils,  
 115  
 of oxidizing substances,  
 113  
 of resins, 115  
 of salts of metals, 115  
 of spirits, 115  
 of waters, 115  
 pharmaceutic, 110  
 physical, 110  
 therapeutic, 110
- Indeclinable nouns, 31
- Infusions, methods of pre-  
 scribing, 128
- Ingredient, calculation of  
 amount of each, 73
- Inhalation, administering  
 remedies by, 122
- Inscription, 21, 48
- Internal administration,  
 preparations for, prac-  
 tice prescriptions for,  
 138
- Intravenous injection, 122
- Introduction, 17
- Inunction, administering  
 drugs by, 123
- Iron, incompatibility of,  
 113
- LABEL, poison, 106
- Latin grammar, 23  
 titles, official, 45  
 why used, 24
- Liniments, 134
- Liquor cocci as coloring  
 agent, 103  
 carmini as coloring  
 agent, 103
- Local external application,  
 practice prescriptions  
 for, 136
- Lotions, 134
- MAGISTRAL prescription,  
 87
- Measures and weights, 56  
 apothecaries', 56, 65  
 metric, 56, 58  
 Troy, 65  
 household, 68
- Medicated baths, admin-  
 istering drugs by, 123  
 papers, 134
- Medicinal agents, modes  
 of administration, 118
- Mercury, incompatibility  
 of, 114
- Metals, salts of, incom-  
 patibility of, 115
- Meter, 58
- Metric system, 56, 58  
 calculation for, in pre-  
 scription writing, 82  
 conversion of apoth-  
 ecaries' system into,  
 64
- Mixtures, methods of pre-  
 scribing, 128
- Mouth, administration by,  
 118
- Mucilages, 99  
 methods of prescribing,  
 129
- NARCOTICS, prescriptions  
 for, 107
- National formulary, 19
- Ne repetatur, 107

- Notes, 105
- Nouns, 24  
 declension of, 25-31  
 in fifth declension, 28  
 in first declension, 25  
 in fourth declension, 28  
 in second declension, 26  
 in third declension, 26  
 indeclinable, 31
- OFFICIAL drugs and preparations, 20  
 Latin titles, 45  
 preparations, suitable  
 methods of prescribing, 124  
 prescriptions, 87
- Official titles, capitalization of words in, 46  
 order of words in, 46
- Oils, incompatibility of, 115  
 methods of prescribing, 129
- Ointments, methods of prescribing, 133
- Oleates, methods of prescribing, 133
- Oleoresins, methods of prescribing, 129
- Oxidizing substances, incompatibility of, 129
- PAPERS, medicated, 134
- Pastes, 134
- Patient, directions to, 105
- Percentage in prescriptions, 81
- Pharmaceutic incompatibility, 110
- Pharmacopœia, 18, 19
- Phrases, 40  
 table of, 42-44
- Physical incompatibility, 110
- Pills, methods of prescribing, 129
- Plasters, 134
- Poison label, 106
- Poultices, methods of prescribing, 133
- Powders, 134  
 methods of prescribing, 130
- Practical writing of prescriptions, 69
- Practice prescriptions, 136
- Practice prescriptions for internal administration, 138  
 for local external application, 136
- Preparations for external use, 133  
 Galenical, 20  
 official, 20
- Prepositions, 38
- Prescription, definition of, 20  
 for alcoholic preparations, 108  
 percentage in, 81  
 standard, 74
- RECTUM, administration by, 120
- Resins, incompatibility of, 115  
 methods of prescribing, 131

- Rules for grammatic construction, 47
- SALTS of metals, incompatibility of, 115
- Semisolid prescriptions, 88
- Sex and dosage, 91
- Shake well, 105
- Shot-gun prescription, 87
- Signatura, 21
- Solid prescriptions, 88
- Solutions, methods of prescribing, 131
- Spirits, incompatibility of, 115  
methods of prescribing, 131
- Standard prescription, 74
- Subscription, 21, 50  
types, 50-55
- Superscription, 21, 47
- Suppositories, 134
- Syrup, methods of prescribing, 131
- Syrups, 99
- THERAPEUTIC incompatibility, 110
- Tinctura caramellis as coloring agent, 104  
cardamomi composita as coloring agent, 102  
croci as coloring agent, 104  
hydrastis as coloring agent, 104  
lavandulæ composita as coloring agent, 104
- Tinctura persionis as coloring agent, 103  
composita as coloring agent, 103
- Tinctures, methods of prescribing, 131
- Titles, official, capitalization of words in, 46  
order of words in, 46
- Triturates, methods of prescribing, 132
- Troches, 135
- Troy system, 65
- UNITED STATES Pharmacopœia, 18, 19
- VEHICLE of prescription, 69
- Vehicles, 97  
alcoholic, 100  
aqueous, 98  
hydro-alcoholic, 100
- Verbs, 33  
conjugation of, 33  
forms of, 34  
table of principal parts, 37  
useful in prescriptions, 38
- Vinegars, methods of prescribing, 132
- WASHES, 134
- Waters, aromatic, 98  
incompatibility of, 115  
methods of prescribing, 132

- Weight and dosage, 90
- Weights and measures, 56  
    apothecaries', 56, 65  
    metric, 56, 58  
    Troy, 65
- Wine measure, 65
- Wines, methods of pre-  
    scribing, 132
- Words and phrases, 40  
    table of, 42-44
- YOUNG's rule for doses for  
    children, 95













P8-CWD-285

